PR
5
B63J
v.48/3

G.K.V.

amaj F... Chen

m. Gurukul Kangri Co

Digitized by Arya Samaj Foundation Chennai and eGangotri

48918

गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार
पुस्तकालय

R
विषय संख्या 590.5
पुस्तक संख्या B63J
आगत पंजिका संख्या V. 48/3
पुस्तक पर किसी प्रकार का निशान लगाना वर्जित है। कृपया १५ दिन से अधिक समय तक पुस्तक अपने पास न रखें 48918

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

COMPILED

अङ्क समाप्तीकरण १९८४-१९८५

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Vol. 48, No. 3. AUGUST, 1949 *Price Rs. 15 net.*

THE

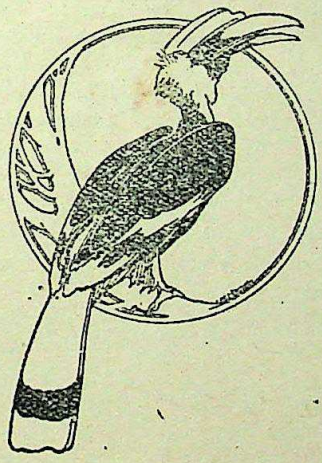
JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY

EDITED BY

SÁLIM ALI, S. B. SETNA, PH.D. & H. SANTAPAU, S.J.



PUBLISHED BY

THE BOMBAY NATURAL HISTORY SOCIETY,
114 Apollo Street, Bombay.

590.5
B63J
V.48/3

LONDON AGENTS:

DAVID NUTT, (A. G. BERRY),
212 SHAFTESBURY AVENUE,
LONDON, W.C. 2.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार
पुस्तकालय

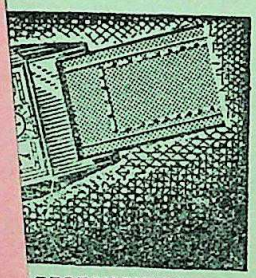
विषय संख्या 590.5
पुस्तक संख्या B63 J
आगत पंजिका संख्या 48,918

पुस्तक पर किसी प्रकार का निशान लगाना वर्जित है। कृपया १५ दिन से अधिक समय तक पुस्तक अपने पास न रखें।

की निशानियां लगाना
दिन से अधिक देर तक
सकते। अधिक देर तक
करनी चाहिये।

WATCH
behind it!

watch than in most
when buying a watch
judge chooses a 'West
reputation of the maker.
name as suppliers of
over three quarters of
you buy a 'West End'
best of its kind, no



RECTANGULAR
d Gold ... Rs. 135
Solid Gold Rs. 286

Watch Co.

V, 48/3 590.5 B63 J
विषय संख्या
48,918
आगत पंजिका संख्या
पुस्तकालय
गुरुकुल कांगड़ी विश्वविद्यालय

संख्या	तिथि	संख्या

पुस्तकालय
गुरुकुल कांगड़ी विश्वविद्यालय
हरिद्वार

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri
590.5 B63J
48918

CONTENTS OF VOLUME 48, No. 3

PAGE

THE MERBAL GLEN AND SOME BIRDS OF THE PIR PANJAL. By Lt.-Col. R. S. P. Bates, M.B.O.U., I.A. (Retd.). (*With a sketch map and 3 plates*) 399

THE INDIAN CADDIS FLIES (*Trichoptera*), Part X. By the late Martin E. Mosely. (*With 12 plates*) 412

SEX RATIOS IN INDIAN BATS. By Humayun Abdulali 423

SPECIATION IN THE GROUP OF GREAT REED-WARBLERS. By E. Stresemann and J. Arnold. (*With a plate and 6 figures in text*) ... 428

BOMBAY FISHERMEN'S INGENUITY. By S. B. Setna, M.Sc., Ph.D., F.N.I. (*With a plate and 5 text-figures*) 444

NOTES ON THE SNAKES AND MAMMALS OF THE HIGH WAVY MTS., MADURA DISTRICT, S. INDIA, PART I—SNAKES. By A. F. Hutton. (*With a text figure*) 454

JUNGLE MEMORIES, PART III. By Lt.-Col. E. G. Phythian-Adams, O.B.E., F.Z.S., I.A. (Retd.). (*With 2 plates*) 461

NOTES ON THE GESNERIACEAE OF BOMBAY. By H. Santapau, S.J., F.L.S. 489

THE GIR FOREST AND ITS LIONS. By M. A. Wynter-Blyth, M.A., F.R.E.S. (*With a sketch map*) 493

NOTES ON BIRDS OF THE IRRIGATED AREA OF SHWEBO DISTRICT, BURMA. PART I. By W. L. Roseveare, I.S.E. (Retd.). (*With a sketch map*) 515

FISHES OF THE KUMAON HIMALAYAS. By A. G. K. MENON, M.A. (*With a text-figure*) 536

THE STUDY OF INDIAN MOLLUSCS, PART II. By James Hornell, F.L.S., F.R.A.I. (Deceased). (*With 23 text-figures*) 543

A BIRD COUNT IN DEHRA DUN. By Mrs. M. D. Wright. (*With a sketch map and a table*) 570

REVIEWS :—

1. Indian Hill Birds. (Ernst Mayr) 573
2. Book of Bays. (H. A.) 573

Additions to the Society's Library 574

MISCELLANEOUS NOTES:—

1. Pariah Dogs killing Tiger. By K. M. Kirkpatrick (p. 575). 2. A tame Fox. By C. H. Donald (p. 575). 3. A diseased Gaur. By Randolph C. Morris (p. 578). 4. Charge by unwounded Bison. By Randolph C. Morris (p. 578). 5. Naturally occurring albinism in a specimen of *Rattus norvegicus* Berkenhout. By J. D. Romer (p. 579). 6. How long does the Giant Squirrel (*Ratufa*) live? By T. S. Subbiara Raj (p. 580). 7. The Blue-bearded Bee-eater (*Alcemerops athertoni* Jard. & Selby) on the Nilgiris. By

REFRENCE BOOK

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar
यह पुस्तक वितरित न की जाय
NOT TO BE ISSUED

Digitized by Arya Samaj Foundation Chennai and eGangotri

Chas. M. Inglis (p. 581). 8. Change in habits of the Ceylon Hawk-Cuckoo (*Hierococcyx varius ciceliae* Phillips). By Cicely Lushington (p. 582). 9. Green Pigeons in a Swamp. By J. K. Stanford (p. 584). 10. Woodcock out at sea. By A. E. G. Best (p. 584). 11. Occurrence of the Woodcock (*Scolopax rusticola* L.) at Mount Abu. By Y. S. Shivrajkumar (p. 585). 12. Mergansers fishing. By Humayun Abdulali (p. 585). 13. Bird migration in India. By Editors (p. 586). 14. Field identification of Birds. By Editors (p. 587). 15. Preservation of Wild Life. By M. D. Chaturvedi (p. 588). 16. What are the causes of the disappearance or reduction of fauna species from certain areas? By R. C. Morris (p. 592). 17. Freak shots. By A. St. J. Macdonald (p. 593). 18. Gleanings (p. 594). 19. 'Aggressive demonstration by Russell's Viper'. By K. S. Dharmakumarsinhji (p. 595). 20. A new species of Pit Viper from South India: *Trimeresurus huttoni* sp. nov. By Malcolm A. Smith (p. 596). 21. Notes on a second specimen of the Skink *Dasia subcaerulea* from Southern India. By Malcolm A. Smith (p. 596). 22. Egg-laying by the Indian Python in captivity. By C. Leigh. (p. 597). 23. A possible cause of blank days when mahseer fishing. By E. P. Gee (p. 598). 24. Moonstruck—fish or anglers? (*With a graph*). By A. St. J. Macdonald (p. 601). 25. On the culture of Grey Mullets in association with commercial carps in freshwater tanks in Bengal (*With a photo*). By T. V. R. Pillay (p. 601). 26. Some observations on *Aplocheilus lineatus* (Cuv. and Val.) in the Madras Province. By P. I. Chacko and S. V. Ganapati (p. 604). 27. Food organisms of the carp *Labeo boggut* (Sykes). By P. I. Chacko and Miss Sharada Subramanian (p. 606). 28. A remarkable aberration of a *Papilio polytes romulus* Cram. (*With a photo*). By M. Suter (p. 607). 29. The egg mass of a Doliid gastropod mollusc from Krusadai Island (*With a plate*). By N. K. Panikkar and P. R. S. Tampi (p. 608). 30. The 'Victory Plant' (*With a photo and 2 text-figures*). By A. R. Rao (p. 610). 31. Bougainvilleas at hill-stations. By Chas. M. Inglis (p. 612). 32. The genus *Ceropegia*: Further comments. By R. Seshagiri Rao (p. 612). 33. The genus *Ceropegia*: Still further comments. By H. Santapau (p. 613). 34. Mass flowering of *Strobilanthes kunthianus* on the High Wavy Mts., in August 1948. By A. F. Hutton (p. 614).

PAGE

Annual Report of the Bombay Natural History Society for the year ending 31st December 1948 615

The Honorary Secretary's Report for the year 1948 616

Appendix to the Honorary Secretary's Report covering the period January to July 1949 622

Statements of Accounts of the Bombay Natural History Society ... 627

Minutes of the Annual General Meeting 630

Catalogue of books in the Society's library, Part III—Reptiles, Amphibians and Fish 631

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

JOURNAL
OF THE
Bombay Natural History Society

1949 VOL. 48 No. 3

THE MERBAL GLEN AND SOME BIRDS OF THE PIR PANJAL

BY

LIEUT.-COL. R. S. P. BATES, M.B.O.U., I.A. (Retd.)

(With a sketch map and three plates)

Karabuduran is perhaps an ugly name but this upland meadow lies at the head of the Merbal Glen, a short valley which has nothing ugly about it at all. The Merbal Glen, with the Singpur Gali near its head, a pass which leads direct to Kishtwar, has many points in its favour. Its views are not staggering, but its climate is cool and refreshing in June and July just when the Vale is stoking up. And its most convenient camp-site can, if necessary, be reached from Srinagar in one day; that is, of course, provided that a sufficiently long-suffering bus-driver can be found to risk his springs on the so-called fair weather motor road. From Achabal the trail follows the Bringh, that stream beloved of fishermen who catch in its well-stocked pools perhaps the best trout in Kashmir. At a point where the river bends abruptly northwards towards the Naubug Valley, the real test commences. Here a bone-shaking track diverges south into the Ahlan Nullah, a track which our driver—evidently very proud of his aged conveyance spouting steam from every pore—described quite seriously as 'not fit for a lorry, only fit for a car.' Seven miles upstream one's remains are deposited at a Forest Rest House. It is from near here on the west bank that the Merbal Glen takes off. This so-called glen is a short nullah, about eight miles long, running from 7,000 feet at its confluence with the Ahlan Valley to round about 13,000 feet, with the Singpur Gali crossing a col on its southern flank a couple of miles short of its head. On the Survey maps the height of this pass is given as 11,709 feet. The view from its summit is one of the most extensive I have seen and must include a considerable slice of Kishtwar. Lacking the grandeur of the usual snowy colossi of this region, its beauty lies

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in the succession of ridge upon ridge, their spurs becoming ever bluer and more hazed as the almost straight valley, from which they radiate like ribs, recedes into the furthest distance. But the story of that summit comes later in this tale.

In June 1942 I managed to put in a month's leave and chose to visit the Merbal Glen for two reasons. In those uncertain days sudden recall had to be considered. Secondly, I felt that in that area I might have a chance of meeting with the larger of the only two laughing-thrushes which Kashmir possesses in any numbers, namely the handsome Western Variegated Laughing-Thrush, *Trochalopteron variegatum simile* Hume. The smaller rat-like Simla Streaked Laughing-Thrush is common enough in and all around the Vale at low elevations, but the Variegated is locally distributed and in the breeding season withdraws to higher altitudes. In all my summers in Kashmir I have but once come across it away from the Pir Panjal mountains, though it is said to occur sparingly on the north side of the Vale on the main Himalayan range. I have a doubtful record for the vicinity of Pahlgam, and a certainty from the slopes below the Margan Pass, but the mountains enclosing the latter must surely be included in the Pir Panjal system.

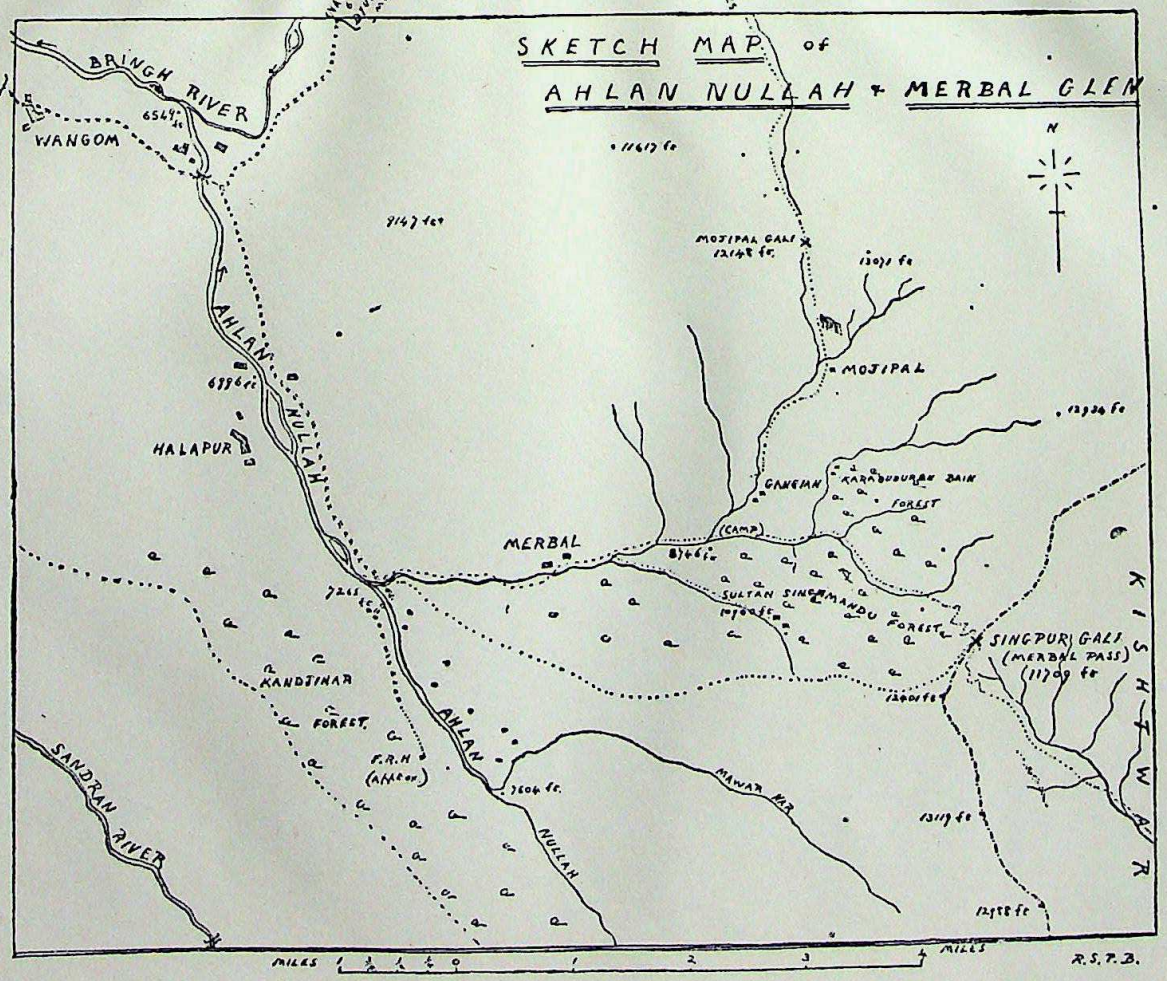
I had a further reason for choosing the Ahlan and Merbal area for this trip. I find there is little on record about the birds to be found on the Pir Panjal side of the Vale, B. B. Osmaston's list of the birds of Gulmarg being the only comprehensive account of a part of the area. In it he also includes observations as far east as Toshamaidan. The birds of the inner slopes of these mountains are not very different from those found in the valleys running into the Great Himalayan Range, but a number of migrants from India prefer to penetrate further into the system than the Pir Panjal mountains. On the other hand, some birds find the slightly warmer and certainly wetter climate more to their liking. For in climate there is indeed a subtle difference.

Ahlan F. R. H. is approximately 7,500 feet above sea level and we arrived there on June 21st. The party consisted of Mr. and Mrs. Lowther and our two selves. Bob Lowther needs no introduction to members of the Society. His beautiful photographs, which have graced the pages of the *Journal* for so long, speak for themselves. This is the sole occasion upon which we have been able to join forces and even then our leaves did not quite coincide; to our great regret the Lowthers left the Merbal Glen just before I ran the Laughing-Thrushes to earth.

Only half the rest-house being fit for occupation, my wife and I pitched our camp in the shade of some trees about 200 yards away. By 3 p.m. the temperature inside our tent ran well into the 80's. The climate struck us as considerably milder than that of Pahlgam, due presumably to the absence of snowy massifs and glaciers in the vicinity and to the restricted nature of the smaller valleys. Of birds there were plenty in variety but not in numbers, except for certain species such as the Large Crowned and Hume's Willow-Warblers. Our list soon included most, if not all, of the species noted at Pahlgam, but in lesser numbers. Dark-grey Bushchats swarmed and Willow-Warblers, as already stated, were

Journ., Bombay Nat. Hist. Soc.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

very numerous. Grey Tits too were common enough, and we soon had two nests to choose from, one between the boards of the rest house wall. I obtained a full, and as I thought, good series of negatives of the latter, but the enlargements from them are disappointing. These tits were feeding small young ones on grubs and caterpillars, and in most cases the grubs have obscured and apparently distorted the bill.

My next victims, on June 27th, were two Western Dark-grey Bushchats, *Rhodophila ferrea ferrea* (Gray). This pair had newly-hatched young in a nest concealed in the longer grass and clover at the edge of a small spinney. The soft waving grasses made photos at the nest well-nigh impossible, so I resorted to the well-worn but, in my view, unsatisfactory trick of providing a nearby perch. No matter how one tries to conceal the fact, such perches always manage to look out of place. On this occasion I made no attempt to conceal its nature, for the male refused to play, going round it, and under it, and fluttering over it. After I had shifted it half a dozen times, he eventually condescended to use it on his way out. His lady on the other hand took to it at once and never failed to take advanage of it at every visit.

It seemed to me that a real difference in the bird-life from that of rivers on the northern side of the Vale showed itself down by the stream. Sandpipers there were, but in small numbers, one or perhaps two pairs to the mile. The same goes for the Plumbeous Redstarts, so amazingly common on the lower and middle reaches of all the rivers from the Madmatti to the Lidar. There were a few more of them up the Merbal Glen as indeed there were of the White-capped Redstarts, but subsequently I came to the conclusion that both these species show a decided preference for streams running into the Vale from the main Himalayan range. Brown Dippers were also scarcer. The Black-eared Kite was, I think, a resident, though an uncommon one. A pair was seen wheeling overhead while we were searching for a sandpiper's nest. Lower down the valley were a few more.

Of unexpected visitors we had three. One morning a Pallas's Fishing-Eagle winged its way upstream and was shortly afterwards seen returning in the direction of the Bringh. The odd birds make forays far up the side rivers at times, but I doubt that they remain for more than a few hours before returning to the lakes, marshes, and sluggish waters of the Vale. Eastern Herons on the other hand, once their nesting is over, regularly visit the middle stretches of the side rivers up to some 7,000 or 8,000 feet, Pahlgam always having one or two throughout the summer. Nor do they confine themselves strictly to the larger waters, for I have seen the odd heron well up small tributaries running through the forests. Here we saw one only, which was standing in the shallows fishing for trout. The last visitor was a Common Myna, the only one seen at Ahlan though there were a few, probably residents, a little lower down the nullah. Later, in the first week of July, a small flock of five appeared on the Karabuduran marg at over 9,000 feet. I wonder if this virile pest is still extending its range? Late in the season eruptions of small parties to quite high altitudes are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

not infrequent, though I only know them as residents in the Vale and along the Jhelum Valley road, except for a colony at Tithwal in the Kishenganga Valley.

I was hoping to move into the Merbal Glen but before doing so spent a morning in the hide at a Western Spotted Forktail's (*Enicurus maculatus maculatus* Vigors) nest. This was an unwontedly open one on a rock ledge amongst the exposed roots of a tree overhanging the south bank of a side stream. Observation showed that both birds in their passage to the nest often paused on a boulder in the torrent six feet directly below it, so the hide was placed to face this rock. Unfortunately the bird which used it most, presumably the female, had a worn tail and a dejected air, traits not at all in keeping with the usual fairylike daintiness of this species. The light under the bank proved very deceptive, necessitating exposures as slow as 1/20th to 1/50th sec. with the lens stopped down to only F 5.6. I would have preferred a much smaller stop to increase the depth of focus, but the Spotted Forktails are restless birds with their long tails for ever on the move like those of the wagtail but in slower time. My photographs of this bird were below par but I'm glad to say Bob Lowther got some better results next day.

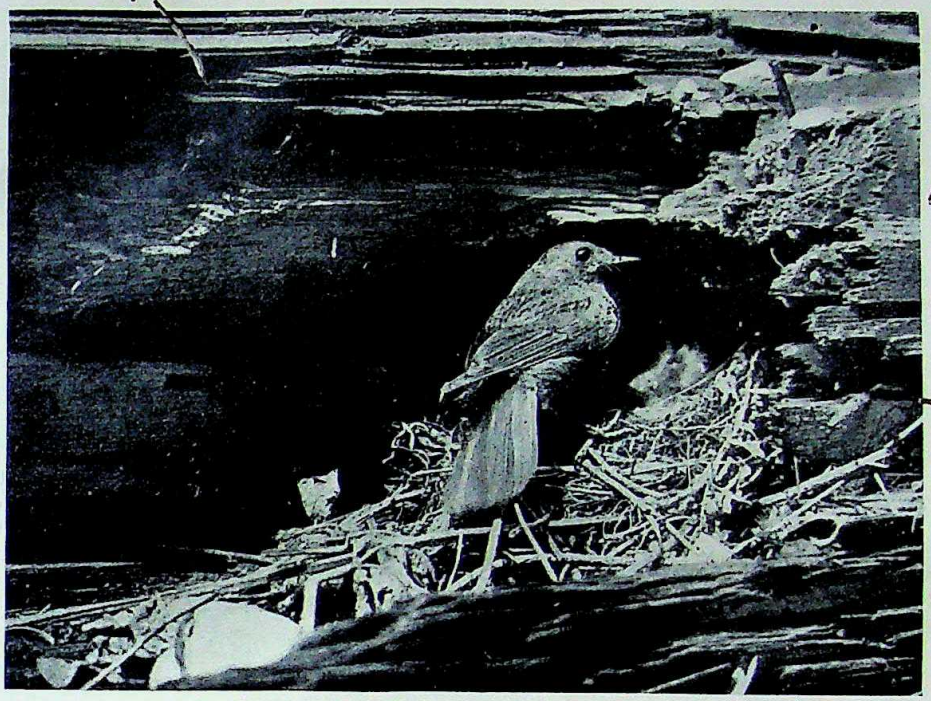
Eventually we moved off on the morning of June 30th. Logging operations were in progress somewhere on the steep hillside and sawn sleepers were being sent down the beck. The head of water appeared far too small to be made use of, but the Forest Department has its own methods for dealing with such trifling difficulties. Long runways of sleepers had been placed in a V in the stream bed. The shallow trickle in the apex of the V cunningly lubricated the runway, so that the slippery pine-logs glided gently down the slope, even taking corners in a series of slight jerks like a tram-car on its rails. Any logs sticking required but a push to start them off again. The whole runway crept slowly downstream, for logs taken from the top end as the supply ran out there, were added to the bottom. But what a tedious business it is; those sleepers must take weeks, perhaps months, to reach the wood depots around Jhelum, for even in the raging main river below Baramullah they are often held up in eddies and on islands.

At approximately 8,700 feet we came to a green lawn. A pine-covered bank sloped down to the torrent on the one hand, while a low ridge overlooked it from the north side of the track. It was not the real beginning of the Karabuduran marg, which lay a few hundred yards further on across a tumbling stream margined with kingcups and mauve lousewort, but it provided a charming and sheltered camping-ground. Indeed it proved later to be the best centre we could have chosen, not only for the Merbal Glen but for exploring three short side nullahs running off it in a northerly direction.

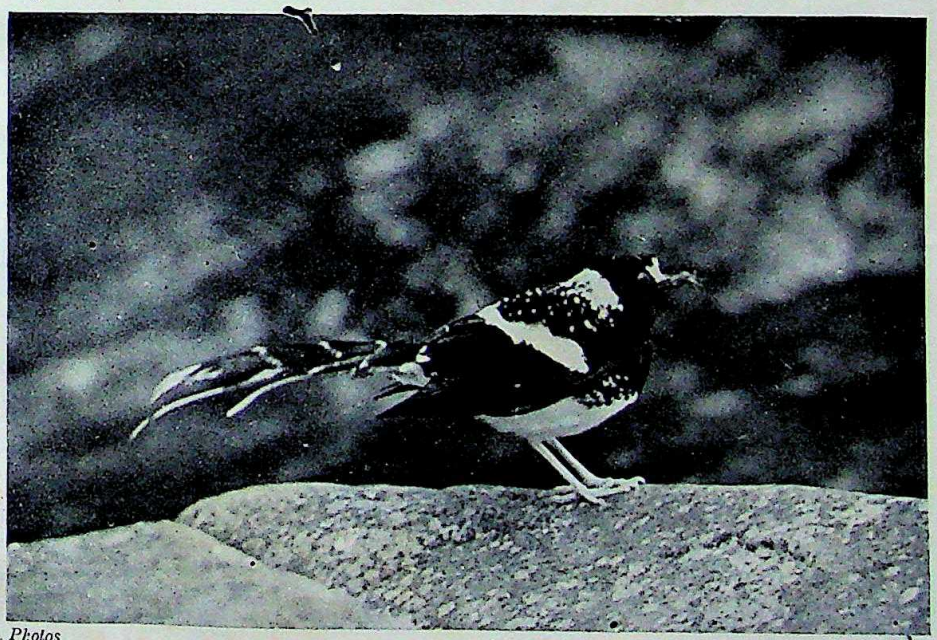
During that first night a rakish dead pine, whose gaunt fingers, twisted fantastically against a starlit sky, bore at intervals the silhouette of Scully's Wood Owls. Their eerie hoots brought back vivid boyhood memories of the Tawny Owls at home to which their calls, though variable, are often similar. On July 8th two

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Plumbeous Redstart (male)



Photos R. S. P. Bates

Western Spotted Forktail

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Photos

Young Kashmir Martins

R. S. P. Bates

Dark Grey Bush-chat (male)

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

newly fledged young ones took up their station in the same place. They kept up a monotonous wheezing all night long, broken only by an occasional crescendo of excited squeaks which usually marked the arrival of a parent.

The same evening I became aware of another noise, seemingly emanating from the servants' camp. Banteringly I asked the bearer where he had got his baby chickens. It transpired that a family of Western Himalayan Collared Pigmy Owlets—what a name for so small a bird—were in occupation of a thick fir overhanging his tent. From their mingled chirps I was unable to sort out any song pattern of adults or chicks. Osmaston describes Gulmarg birds as having a four-noted bell-like whistle. On the other hand, when on my way up to Kashmir, I had been lucky enough to catch sight of one in the Dak Bungalow compound at Domel, observing it for some minutes in the beam from my torch. It was *tonking* away as monotonously as a Coppersmith, bobbing its head from side to side at every note which gave its voice a ventriloquial effect. The calls were definitely not in series of four notes but in long sequences of more or less evenly-spaced squeaks, which I can only describe as midway between the high-pitched squeak of a bat and that of a tree-rat.

Next day, when I was looking into the fir tree to see if I could spot the owlets at roost, a family of Brook's Nuthatches trickled one after the other into an adjacent pine. The fledglings sat across a horizontal bough in the way normal to the majority of perching birds, and seemed quite averse to moving like their parents up and down the bark and on the undersides of sloping branches.

Before commencing the search for Laughing-Thrushes and other higher altitude birds, I felt I must have a morning with a pair of Plumbeous Redstarts *Rhyacornis f. fuliginosa* (Vigors). Eventually I had to devote a second day to their photography, but it was time well spent. The nest, in a rift in a huge fallen log at the water's edge not far below our tents, was well lighted, giving me a good chance to portray the female's characteristic tail, the constant fanning of which, combined with a ceaseless up and down waving, results in a flickering effect through the periodic covering and uncovering of the increasing white on the outer rectrices by the brown terminal wedge. Is this flicker a signal to the male, a quick pointer to her whereabouts amongst the spray-covered boulders of the raging torrents, for the scintillating effect certainly catches the eye? Or is it a warning to others of the species that here is an occupied area? The Plumbeous Redstarts are intensely jealous of their territory, chasing away intruders with extreme energy quite irrespective of sex.

On my way back to camp I disturbed a Little Forktail at the junction with a small stream tumbling abruptly from the wooded slopes below Sultan Singh Mandu. This steeply falling nullah with its frequent falls and shaded rifts was typical of this forktail's habitat. A pair of Red-browed Finches was also seen, and at almost the same instant a larger secretive bird dived from a pine into some *Viburnum* scrub. This glimpse was sufficient to direct my attention to the possibility of finding the nest of the Western Variegated Laughing-Thrush within easy reach of camp. The following day,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

therefore, was spent in a search along the forest edge up the left bank of the main stream to well beyond the limits of the Karabuduran marg. The undergrowth fringing the trees was composed largely of *Skimmia*, the steep bank falling thence to the bed of the stream being covered with *Viburnum* and other bushes and young firs. In spite of the seemingly favourable terrain we drew a blank, our sole find being one disused nest, an interesting nest which I am sure had been built by these thrushes. It was composed of a substantial circlet of coarse grass filled in with many sheets of papery birch bark, layer upon layer, a few of the pieces being nearly 8 inches long and 3 inches wide at their broadest. Inside this pad of bark was a thin lining of fine grass and tenuous roots. It was well concealed about three feet from the ground in one of the young firs.

Notwithstanding the poor beginning, the day ended with promise. Returning down the marg on the main track, we passed a large patch of *Viburnum* from the middle of which protruded a lonely and conspicuous sapling. From nearby there flew two laughing-thrushes. Their flight was like that of the Seven Sisters or Jungle Babblers of the plains, low to the ground with rapid wing-beats interspersed with unsteady glides. The tail was well spread showing the row of white spots at the end. In some ways, perhaps owing to the preponderance of olive-brown in the plumage, they looked not unlike very large White-cheeked Bulbuls without the crest. In the first fork of the sapling was an untidy grass nest, easily spotted at some distance as it was above the general level of the *Viburnum* scrub. Though empty it warranted further inspection. As we hunted about, the birds called loudly from the farther bank we had so lately searched, *weet-a-weer weet-a-weer*, a far-reaching and quite unmistakable cry.

By July 8th the nest held two eggs, and on the 9th when we went to erect the hiding tent on the platform of logs we had already built up, one of the birds was sitting on three eggs and continued to sit while we worked within 9 feet of her. In spite of the washed-out blue-green ground colour, the blunt eggs were rather handsome, for they were boldly blotched with rich reddish brown—Whistler, I see, calls it liver-red—and some underlying purplish spots. They were large eggs: the average measurements are given as 27.8 × 21.0 mm. Next morning I set off with great eagerness with all the bird-photographer's stock-in-trade, only to find the nest awry and no signs of eggs or birds.

It was another week before I was permitted to succeed with this species. First I tried a small nullah half a mile below camp. It took off in a northerly direction, its east flank dotted with tall trees amongst rank vegetation and patches of bushes. But the most striking features of that sharp slope were clumps of tall Kashmir Mallows in full flower and whole regiments of the withering stems of Crown Imperial lilies. What a sight that hillside must have been in May. Now the dishevelled wands were surmounted by bursting capsules, some of which had already spilled their seeds, but others rattled so invitingly that, before leaving the glen, we filled two marmalade jars with their flaky contents. In these favour-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

able surroundings we saw two pairs of laughing-thrushes but could find no nest. I noticed that these birds readily ascended the isolated trees but dived for cover on our nearer approach.

I next tried the Mojipal nullah. The lower end, where there is a village of sorts, is not pleasing country, but higher up it proved to be our happiest hunting-ground and soon produced a couple of laughing-thrushes' nests which each contained two young ones. These nests were at an elevation of approximately 10,200 feet as opposed to the Karabuduran nest's 9,000 feet. Both were 4 feet from the ground in *Viburnum* scrub with no large trees in their immediate vicinity. They were 200 yards apart on opposite sides of the nullah. The owners were very secretive, and both nests were found only after diligent searching and not by watching the birds. I chose to work the one which was on level ground, the other being on a steep bank above the stream which would have necessitated facing the lens into the sun. On the 13th and 14th mornings I got the photos I so desired. The parents proved to be tame enough and soon became used to the hide. They were fairly noisy, shouting across the nullah to one another *weet-a-weer, weet-a-woo-weer*, while they also indulged in much squealing in the thick cover to the left of the hide, making subdued noises which sounded just like a nestful of quite small chicks.

During our first morning in the Mojipal nullah, a gujar informed me that a number of small birds were nesting low down on the face of a cliff near the nullah-head. While I was dealing with the laughing-thrushes, I sent my shikari, Khalik Khan, to investigate. He returned with good news. It turned out that an hour's walk away, at an elevation of about 11,000 feet, there was a small cliff with the lower part scooped out so that in wet weather by standing close to the face the rain did not reach one. Immediately I saw it, it reminded me forcibly of Kilnsey Crag in my native Dale. Here and there beneath the overhang numbers of Kashmir Martins, *Delichon urbica cashmeriensis* Gould, were busy nesting. I counted 16 nests straight off and I believe there were more. A few could actually be reached by standing on tiptoe; more could be investigated from another man's shoulders, while none was above 15 or 20 feet from the ground. But what intrigued me most was how variable they were in construction. Few of them were the neat inverted 'bee-hives' one sees under the eaves and in the window-corners of houses and barns in Britain—not more than four. The majority had been constructed ingeniously to accord with the requirements of the their sites. Those in narrow slits had the slits cemented in for some distance above and below the entrance hole. Others in water-worn cups merely had the doorways reduced in size. One or two had practically no mud-work at all, just a few straws and feathers laid within the cup. Yet again, I noted nests under a snug ledge which might easily have been taken for those of Crag Martins, had it not been for the rows of dark brown and white neat heads peeping over the rims soliciting food. At least 5 nests contained young, large enough to fly at any moment, but close to the one I decided to photograph, a pair was building a new nest on the foundations of a structure which had collapsed. There were two

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to three young in each nest, though I seem to recollect that one actually held four; I would not like to record this as a certainty, however. The parents spent but a fraction of a second at the nest, often transferring food into a wide-open gape without alighting at all. The arrival of a parent caused me much amusement, for it was a signal for a pair of heads to appear at every hole, the lot turning in unison as the bird flew along the cliff face. Two heads were all that the normal hole would admit at a time, though occasionally a third managed to squeeze itself into the opening.

As the direct afternoon sun could not reach my chosen nest, I hoped for a cloudless sky, and indeed the appointed day started well. Before the camera was in position, however, the sky had become overcast, and within half an hour a continuous drizzle was falling. When I left the hide, drifts of cloud obscured the summits of the pines and water dripped steadily from the cliff's overhang. It is hardly surprising that my photographs were far from successful since I had to attempt exposures of 1/20th of a second and slower with a wide stop on birds which arrived, usually without warning, to pass over their catches without pausing even to fold their wings.

Wreathing mists in the cheerless upper regions of the glen affected one with a strange feeling of isolation, but as I entered the wider space where the laughing-thrushes were skulking in the *Viburnum*, the sun came out, and I found myself taking notice of a little nature's garden by the stream. Pinky white *Morina* was pushing its way between the blue-grey stones, a neat and pleasing plant in spite of its thistle-like appearance and narrow prickly leaves. The sweet scent of the Yellow Morina makes it the more notable plant, but the coarser foliage and straggling flowers render it too untidy to compare favourably in appearance with this pink variety. A giant ragwort, with huge basal leaves well over a foot across and close-packed flowers in a tight raceme on a stem four feet high, also caused me to linger.

The pause disturbed a White-capped Redstart, *Chaimarrhornis leucocephalus* (Vigors), with its bill packed with flies for four small young in a nest under a boulder close to the stream. As it turned out, an unfortunate find this, since it caused me to spend an hour or two the next afternoon trying to depict the characteristic poise of this brilliant morsel, in particular the upright stance with wings adroop and black-tipped flame of a tail flicked vertically upright. Two exposures seemed to me to portend success, but, alas, in one the bird appears to possess no tail whatsoever, so rapidly has the flick occurred. The other, a backview which hardly does it justice, is spoilt by out-of-focus blobs in the middle distance. The time would have been better spent with the Martins again, since the day was a brilliant one.

With the exception of the Plumbeous Redstarts and the laughing-thrushes, my photographs on that expedition were far from good but in many other ways the Merbal Glen repaid us for the visit in good measure. A climb one morning to the top of the pass is more than worthy of record. One zigzags up a rather bare slope for 1,500 feet, an easy climb and one which might become boring since the views are nothing to shout about. But, after

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Western Variegated Laughing-Thrush

Photos *R. S. P. Bates*

Himalayan Mistle-Thrush on nest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

passing through the scattered trees not far above the stream where *Salvia hyans* was much in evidence, patches of dwarf rhododendron appeared, the flowering season now over. These, however, were backed by large bushes of *Rhododendron campanulatum* in full flower. Here and there beside the path were dainty hairbells and potentillas, while, topping the ranker grasses, were large mauve asters with narrow shaggy petals like many radiating spokes, the hub of the wheel yellow, the rim white. Though the valley below us was dank with smoky cloud, the drizzle cleared as we came to the summit of the col to disclose a view of great beauty. So far could we see through the clear washed air that the number of ridges appeared infinite, becoming a more hazy blue as they faded into a lavender distance. No snow-capped giants, no threatening cliffs of ice, but a friendly vista of tree-clad spurs radiated like ribs from the straight valley at whose very head we stood. A lark was singing to the left and a buzzard spiralled up from the Kishtwar side to sail lazily over our heads. A single Blue Rock-Thrush traversed the pass, and from far below could be heard the tapping of a woodpecker. We lazed in the shelter of a boulder eating a haversack lunch. So happy were we that we assayed the pass for a second time the very next day. It rained with unremitting zeal while we climbed through a thick fog. At the top we quaffed hot dal soup from the thermos while waiting vainly for the clouds to disperse. Our sole visitor this time was once again the Blue Rock-Thrush. In a dismal drizzle we turned for home. The narrow Karabudurun marg and its flanking pines, a couple of thousand feet below, appeared at intervals through rifts in the swirling mists. It was an eerie scene but not without beauty, and by no means a bad ending to my leave.

II

As a further article I have in mind has nothing to do with the Pir Panjal side of the Vale, I would like to add some notes relating to the Gulmarg area, since in the following year we spent a few days at Gogaldara and a week on Killenmarg. Arriving on June 3rd at Tangmarg, we crossed the Ferozpur nullah to pitch camp at the edge of some pines fringing a steep slope down to the river. The two days wait there, forced upon us by the delayed arrival from Lahore of some of our kit, was not altogether wasted, for I had dealings with three interesting birds.

The first morning, as we were breakfasting in the open doorway of the tent, a Western Collared Pigmy Owlet, *Glaucidium brodiei brodiei* Burton, snatched up a lethargic cicada almost at my feet and proceeded to devour it close by on a low branch of a pine. Standing on one foot, it conveyed the insect to its bill in the other, pulling fragments off it after the manner of a parakeet dealing with a nut. It then flew to a medium-sized chestnut tree on the fringe of the wood where it disappeared into a woodpecker's boring about 15 feet from the ground. As I peered into the hole, the owl's head slowly came up to investigate the disturbance. I could not help laughing at it. Well back in the gloom and neatly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

framed in the circular opening, it looked for all the world like a wizened old man with Dundreary whiskers. It stared solemnly and sadly at me for at least half a minute and then just as slowly sank again out of sight. The hole, being that of a Pied Woodpecker, was too small to admit even my wife's hand, so I failed to ascertain the contents. We left it in peace, and had the satisfaction of sharing the half-light of our shady pines on two or three occasions before we left, for it was not altogether nocturnal, being on the move sometimes up to about 9 o'clock.

Down the hillside a pair of kestrels was extremely noisy. They had a nest, an appropriated Jungle Crow's I at first thought it to be, some 40 feet up close to the main trunk of a large pine. Twice I saw coition take place, but it was not until the morning we left, June 6th, that the first egg was deposited. On our way back from Killenmarg to Srinagar on the 20th, I made a point of slipping across the nullah to see how these birds were faring. Confusion reigned. They appeared to be at loggerheads with a sparrow-hawk, which twice approached the nest while I was standing at the foot of the tree. I considered this behaviour sufficiently strange, but when I saw the nest's contents my curiosity was vastly increased. There were now three eggs, two of them the dull mottled red of the kestrel's showing little or no ground colour. The third had a flat blue-white ground and some large blotches of a somewhat richer red-brown scattered chiefly at the smaller end, if smaller end it can be termed, for in truth there was little to choose between either extremity. This egg, in fact, agreed with many sparrow-hawk's eggs I have seen, but with no kestrel's egg it has ever been my lot to examine. After photographing the eggs in the nest, which, incidentally, was made almost entirely of sticks, finer ones in the cup, I removed them. As I suspected, those of the kestrel type were none too easy to blow, having been incubated for some 12 to 14 days, but the third egg was absolutely fresh. Could this egg have been laid by the sparrow-hawk I encountered that morning? Is it not possible that the nest was used originally by the sparrow-hawks, who, having turned up to reclaim it were now engaged in battle with the kestrels, a battle which they appeared to be winning! It is impossible to say with certainty that such is the case, but I give this solution for what it is worth. A point which perhaps militates against it, is that I see Stuart Baker states in the *Nidification* that the sparrow-hawk does not normally use a nest for more than the one season. Subsequently I sent the eggs to the Prince of Wales's Museum, Bombay, where no doubt any member who wishes to see them can run them to earth.

Prior to leaving the Ferozpur nullah for Gogaldara, I spent a couple of hours in the hide photographing a Simla Black Tit, *Lophophanes r. rufonuchalis* Blyth. As usual its nest, containing young ones, was in a hole in the ground. This ran horizontally into a grassy bank. I have at times found them in tunnels, often amongst tree roots, entering the ground at so steep an angle that the bird literally fell in head first from some overhanging twig or foliage. I know the *Nidification* has it that holes in and near the ground are the exception rather than the rule, but I am convinced

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

that at least in Kashmir the position is actually the reverse of this. The majority of nests are in holes, often rat-holes, in grassy banks, under the roots of trees, and sometimes in walls. I once saw a bird disappear down a small hole in the very middle of a well-used path made up of hard-trodden earth from which all vegetation had been worn away. It was taking moss down to a cavity some inches below the surface. Perhaps it liked the sound of tramping feet! It is the Crested Black Tit, *Lophophanes melanolophus* Vigors, slightly smaller and with an inconspicuous row of spots on the wing, which patronizes the tree sites between say three and 20 feet. But to revert to my Ferozpur bird. Just as I was warming to the task, after one of the birds had arrived with a Large White butterfly in its bill, an unusual occurrence to say the least of it, a troupe of Rhesus monkeys reached the vicinity and made such nuisances of themselves that I had to leave the side.

I'm afraid that I did not find the Pir Panjal forests around Gogaldara particularly birdy; in fact they were disappointing in comparison with those on the north side of the Vale, but all the same I was struck by the comparatively large numbers of hobbies. During the few days we occupied the F.R.H. there, June 6th to 14th, I marked down three pairs of these little falcons which appeared already to have commenced nesting. All had their nests high up in pines, not in isolated ones, but in localities where the trees were dotted about in clumps which could hardly be described as true forest. I have seen them in the same type of country on the other side of the Vale; for example, in the Erin nullah and at Aru in the Lidar Valley. They also nest within the fringes of the heavier woods. I could only reach one of these nests. It was still empty, even when we left, but that did not save me from being repeatedly dive-bombed on the 7th while I was climbing up to it. In Kashmir the hobbies appear to lay a little later than the other falcons; usually round about the end of June and in July.

The Gogaldara Rest-house, and a barn close by, had been patronized by a pair of Himalayan Whistling-Thrushes. There were two compact but old nests under the gable ends of the former, while a newer one was on a tie-beam inside the out-house. As I came out through the barn door, I almost collided with a young turtle-dove which swerved in to escape a pursuing Jungle Crow, for the terrified fledgling was still weak on the wing. I considered it best to shut it up inside for a spell. When I returned, an hour or so later that villainous crow was still on guard. As I opened the door, the dove flew from underneath the hut—it had found a way through some broken floor boards. The crow overhauled it within a hundred yards, forced it down behind some bushes, and as I panted to its rescue, cruelly beheaded the poor thing before my very eyes, and flew off with its ill-gotten prize, leaving the warm gorey body twitching on the ground. Jungle Crows are appallingly destructive of eggs and young, but I had not previously seen one pursue an active fledgling with such persistence.

On June 7th I found a Mistle-Thrush's nest containing 3 fresh eggs, the clutch being completed to 4 the following day. It was built near the end of a drooping fir branch not very well screened

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and only 7 feet from the ground. It was overhanging the edge of a path leading through the forest from some cultivation lower down the hill-side. I watched the bird sitting quite peacefully as a couple of men walked underneath the nest, utterly unconscious of her presence. A few days later I roped the branch to one a little higher up, as a man with a tall load bumped an egg to the ground. The wood here was of open character with some deciduous trees in it as well as the pines. Mistle-Thrushes were well distributed over these hill-sides, for their loud song, which carries well from the higher tree summits which they invariably choose for singing-posts, was borne to us every morning from most points of the compass. I found one other new, but as yet empty, nest in an almost identical situation. Their nests are at times seen close to the tree-trunks, and occasionally in the forks of small saplings, but I think this drooping-branch site is a highly favoured one. Both these nests were typical, a copious grass lining over a certain amount of clay, the outer parts consisting of coarse twigs well covered with lichen and mosses.

I had no difficulty whatsoever in getting the Mistle-Thrush's photograph. She wanted to return to the nest long before I was ready for her, and indeed did so. Perhaps this was why I made the mistake of completing the erection of the tent and —I must confess it—its quite unnecessary camouflaging, before ascertaining the best distance at which to place the camera. I found I was too close for comfort, the depth of focus being too narrow and the field too restricted. Using the small plates ($3\frac{1}{2}'' \times 2\frac{1}{2}''$) insufficient surroundings to the nest were shown, and I had to content myself with well-stopped-down portraits of her Ladyship incubating. As she insisted on getting well down into the cup, I was unable to show to advantage the bold spotting of the underparts. It is most important first to get the camera correctly positioned and then to build up the hide around it.

Tickell's Willow-Warbler is the last bird about which I wish to write. We encountered it, of course, after moving up to Killenmarg. Where the slopes steepen beyond the skiing hut, where dwarf rhododendrons and the large *Rhododendron campanulatum*, with delicately tinted mauve and pale blue flowers, make their appearance, this little bird became evident. It was here, on the morning of June, 16th, at a little above 11,000 feet, that I saw a Tickell's Willow-Warbler, *Phylloscopus affinis* (Tickell), with a short length of grass in its bill. Which of the two untidy beginnings, 18 inches from the ground in a small patch of juniper, was to become the finished article, I could not say, nor did the bird seem to have quite made up its mind. After tea we went up again, taking the hide with us. There was then no doubt about their plans. These minute warblers, choosing to nest from 11,000 feet up to the permanent snowline, have of necessity to crowd their nesting into a short space of time. We found them feverishly at work on a structure which was already taking shape. So intent were they on their important work that I believe the tent was quite unnecessary; a simple screen would have sufficed, for, except when I was kneeling directly between the tent and the nest with my feet close to the fast-growing untidy

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ball, their visits never ceased. Both birds were hard at it, finding all the material they required around the immediate bush in which they were building.

I was in the hide next morning soon after 7 a.m. They were building in furious bursts lasting about quarter of an hour, still finding their lengths of dry grass within a small radius from the nest. This was quite conspicuous—it often is—being wedged into the dark outer foliage of a low juniper bush with which the almost white straws contrasted strongly. It looked to me as if they would soon start bringing the feathers with which they so thickly line the envelope for protection against the bitter nights. I was a little too soon for that. At the end of each burst they flew 50 yards or so down the hill-side to feed quietly for a few minutes before resuming operations. Altogether I used 16 plates on them, varying the exposure and stop between F8 and 1/200th and F16 and 1/40th. The light even in the early morning was very strong. I was able to tell the birds apart by the way in which one of them jumped at each clap of the shutter, raising its wings slightly as it did so. But whether the nervous one was the male or the female I cannot say. I suspect it was the male for its visits were the less frequent of the two and the female is generally the bolder at the nest. For the fast exposures I was perforce using the focal plane shutter, but, even when employing the silent *Luc* shutter, I had few failures, only three of the negatives showing movement.

Shortly before 10 o'clock I packed up. Variegated Laughing-Thrushes were calling in some tall bushes on the edge of the marg, and somewhere beyond a stony ridge a Central Asian Blackbird was nest-building, repeatedly flying over my head with quantities of material in its bill. Unfortunately I failed to locate the site for it became very cautious as soon as I entered its territory.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE INDIAN CADDIS FLIES (*TRICHOPTERA*)

BY

THE LATE MARTIN E. MOSELY

(*Dept. of Entomology, British Museum, Nat. Hist.*)

PART X

(*With 12 plates*)

(*Continued from page 245 of this volume*)

SERICOSTOMATIDAE McLACHLAN (*continued*)

Anacrunoecia gen. n.

Spurs, 2, 4, 4. In the ♂, the basal joint of the antenna armed with a furcate process at its base. In some species there is an additional small branch placed very close to the main furcate process; no process towards the middle of the joint. Maxillary palpi two-jointed, varying in shape in the species. Wings clothed with hairs and scales; post-costal fold very long, situated towards the centre of the wing, with three large cellules between it and the lower margin, (four in *A. assamensis*). Inferior appendages generally furcate at the apices, with an erect branch at the base.

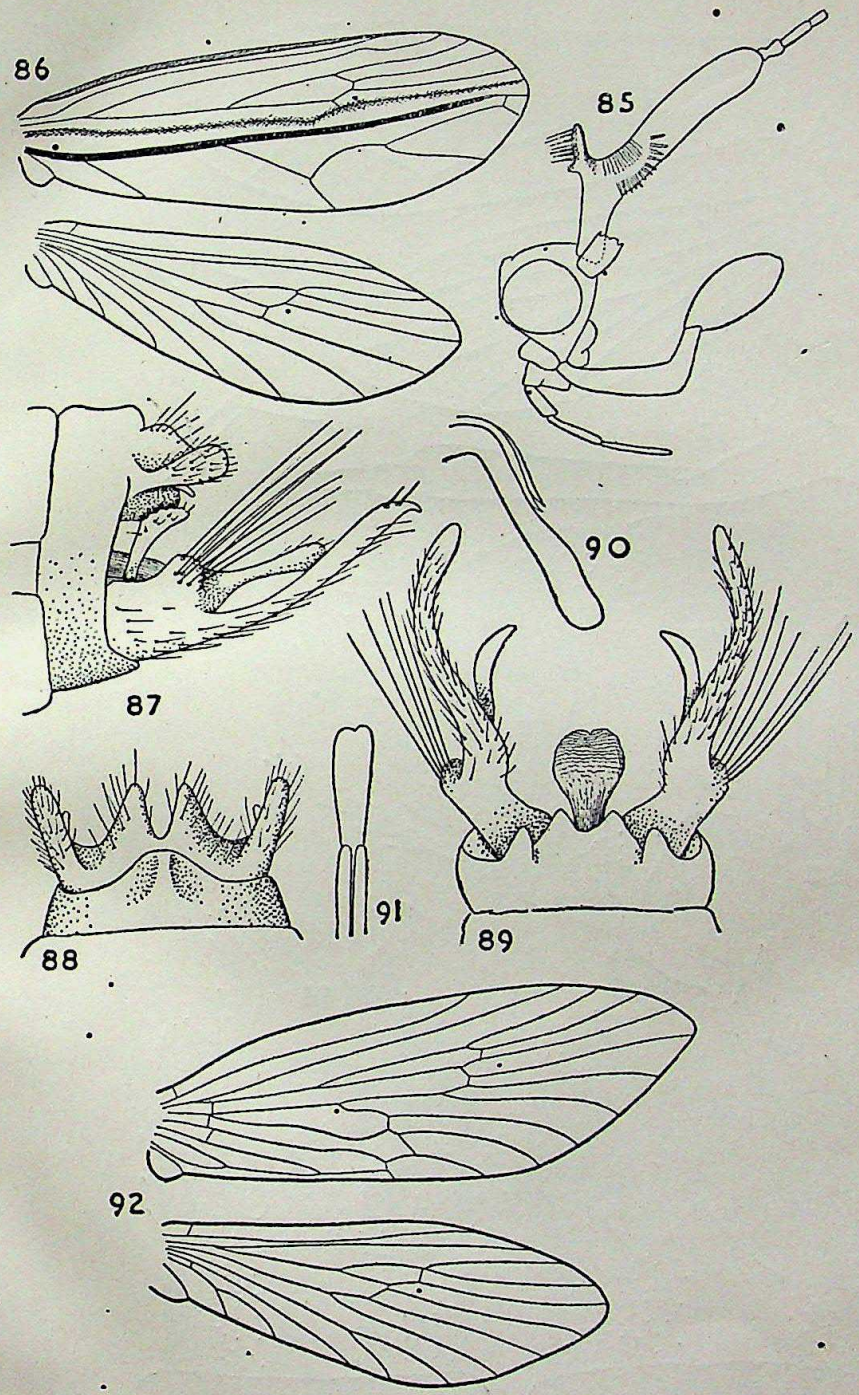
Genotype,—*A. atania* sp. n.

Anacrunoecia assamensis sp. n. Figs. 85-92.

Insect warm chestnut brown; description of the ♂; basal joint of the antenna not very long, a single branch towards the base, its margin fringed with long, peg-like spines or teeth; this branch carries a subsidiary branch or wart on its inner basal margin; above the branch, the basal joint is somewhat hollowed out, the surface of this hollowed portion being set with transverse ridges; maxillary palpi membranous and two-jointed, basal joint elbowed, terminal joint broad, much dilated; wings clothed with hairs, and with a few scales at the basal end of the central groove, none on the posterior wing; costal margin of the anterior wing with the extreme edge folded over; discoidal cell rather long, a groove through the middle of the wing nearly to the apex, a fold just beneath it; four cellules along the posterior margin, of which the second from the base is the largest; in the posterior wing, the base of the fourth apical cellule extends further inwards than the base of the discoidal cell; in the ♀, fork no. 5 present in the posterior wing. Genitalia ♂.—Ninth dorsal segment produced at its centre in a broad triangle beyond which is a dorsal plate, produced at its centre and excised to make a pair of large angular projections; the outer angles of the plate are produced in finger-like processes directed tailward and separated from the central triangles by rounded excisions; each of these processes bears a small finger

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

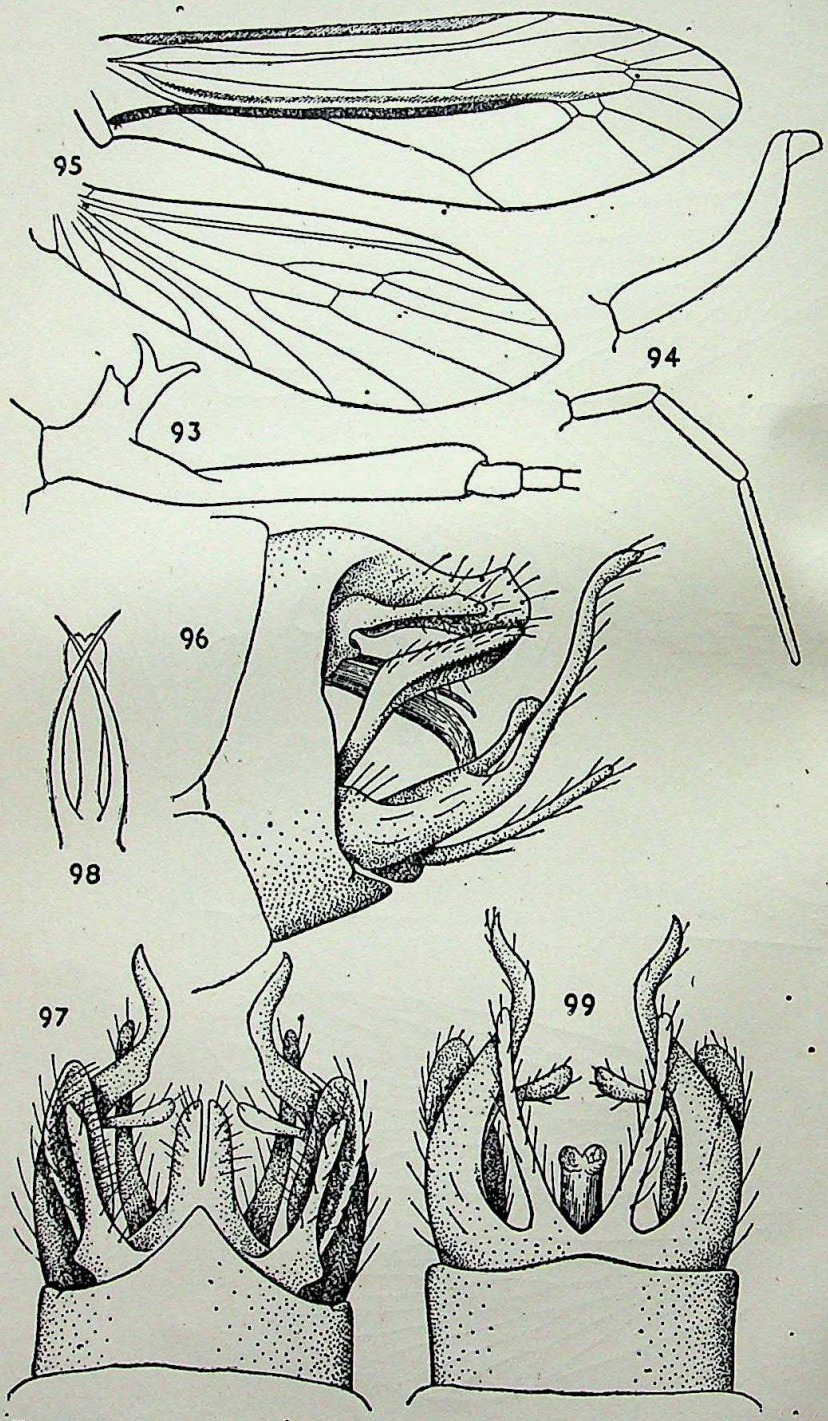
Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 85–92. *Anacrunoecia assamensis* sp.n. 85, ♂ head from side. 86, ♂ wings. 87, ♂ genitalia, lateral. 88, ♂ ninth segment and dorsal plate, dorsal. 89, ♂ ninth segment, inferior appendages and penis, ventral. 90, penis and sheaths, lateral. 91, penis and sheaths, dorsal. 92, ♀ wings.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 93–99. *Anacrunoecia atania* sp.n. ♂. 93, base of antenna, inner surface. 94, maxillary and labial palpi, lateral. 95, wings. 96, genitalia, lateral. 97, genitalia, dorsal. 98, penis and sheaths, dorsal. 99, genitalia, ventral, dorsal plate omitted.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

directed downward on its under surface; penis straight, from above and beneath, with a narrow stem and dilated apex; sheaths short and symmetrical, lying side by side over the base of the stem, inferior appendages single-jointed, branched, the main stem short and stout with the lower angle produced in a long, slightly upcurving, fringed finger with an acute apex; this finger is rather more than twice the length of the base, of which the outer angle is slightly produced and rounded; on the inner side of this rounded angle arises another long branch, which is constricted in the middle, gradually expanding to a rounded apex, from beneath, caliper-shaped; this branch is rather more than half the length of the fringed finger; a third and rather shorter branch arises from within the upper margin of the appendage at its base and is directed upward, gradually dilating to a roughly truncate apex; ventral margin of ninth segment produced at its centre, leaving two pairs of triangular processes.

Length of anterior wing ♂ 9 mm.
Length of anterior wing ♀ 10 mm.
Length of basal joint of ♂ antenna 1.75 mm.

Assam: Cherrapunji.

Type ♂ and paratypes ♂ ♀ in the collection of the British Museum (N.H.)

Anacrunoecia atania sp. n. Figs. 93-99.

Insect brown in colour; basal joint of the antenna in the ♂, long and broad from the side; at its base, on the upper surface, is a stout, inturned, trifurcate claw, fringed with the usual spine-like hairs and with the centre fork the longest; maxillary palpi two-jointed, basal joint long and curved, terminal joint very small; labial palpi, terminal joint very long and slender, about twice the length of the second, which is half as long again as the first; a spur on the posterior leg unusually thickened; wings clothed with hairs and scales, the latter mainly confined to the nervures, all forks and cellules sessile; anterior with a deep costal fringe attached to a narrow edge of the costa, which is turned over along the subcosta; a median groove and a post-costal fold very close beneath it; four cellules along the posterior border, of which the second from the base is the largest and the third is triangular and is connected to the border of the wing by a nervure; neuration very aberrant; posterior wing with a normal neuration, fourth apical cellule extending only slightly further inwards than the basal angle of the discoidal cell.

Genitalia ♂.—Ninth tergite produced in a wide triangle; beyond it is a large dorsal plate bearing two pairs of processes, the middle pair long and rather broad and separated by a narrow excision; the outer, slender, constricted at the middle and dilated at the apices; from the side, the base of this process is roundly excised with a small knob on the lower margin; penis short, directed downward with two spine-like sheaths crossing each other above it; inferior appendages single-jointed, four-branched; the upper branch broad and spatulate, directed upward and then slightly distally and situated at the base of the appendage towards its

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

upper margin; the second and third branches arising from a stout base, the lower very long and sinuous, about twice the length of the upper, which is directed inwards with a clavate apex; another long and slender branch arises from each lower margin at the inner basal angle as seen from beneath.

Length of the anterior wing ♂ 9.5 mm.

Length of the basal joint of ♂ antenna 1.61 mm.

N.-E. Burma: Kamtam, 12. vii. 1934, 6,300 ft. R. Malaise.

Type ♂ in the collection of the Stockholm Museum. Paratypes in the Stockholm and the British Museum collections.

Anacrunoecia digitata sp. n. Figs. 100-105.

Insect brown. In the ♂, wings covered with hairs and scales; anterior with the costa narrowly folded for almost its entire length; post-costal fold situated nearly as far up as the centre of the wing, long, extending practically to the apex, fringed with a very dense row of thickened hairs; in the post-costal area are three large cells, the upper triangular, the other two of about the same area; discoidal cell long and narrow; all the apical cellules very long and narrow, except the third which is long but broadened at its base; posterior wing with the neuration regular. Basal joint of the antenna about as long as the width of the head with the oculi, very stout, with a strong branch at its base, apex furcate, small irregular processes situated on the inner surface of the joint; the lower margin at the base, deeply indented. Maxillary palpi two-jointed, basal joint stout, terminal about the same length but more slender and covered with a furry vestiture; labial palpi with a long terminal joint.

Genitalia ♂.—The apical margin of the ninth tergite is produced in three long processes of which the central is excised nearly to its base, leaving a pair of long, slender fingers, sparsely clothed with bristles; from the side, the lateral processes are very deep, the central fingers projecting beyond them; penis short, apparently without sheaths; inferior appendages with a single short branch, only visible from the side, arising at the base from the upper surface and directed upward; apex of the appendage produced in what may be a second joint or the vestige of one, welded to the basal joint; lower surface very heavily clothed with thickened hairs.

Length of the anterior wing ♂ 11 mm.

Length of the basal joint of the antenna 1 mm.

Assam: Khasi Hills, from the McLachlan collection.

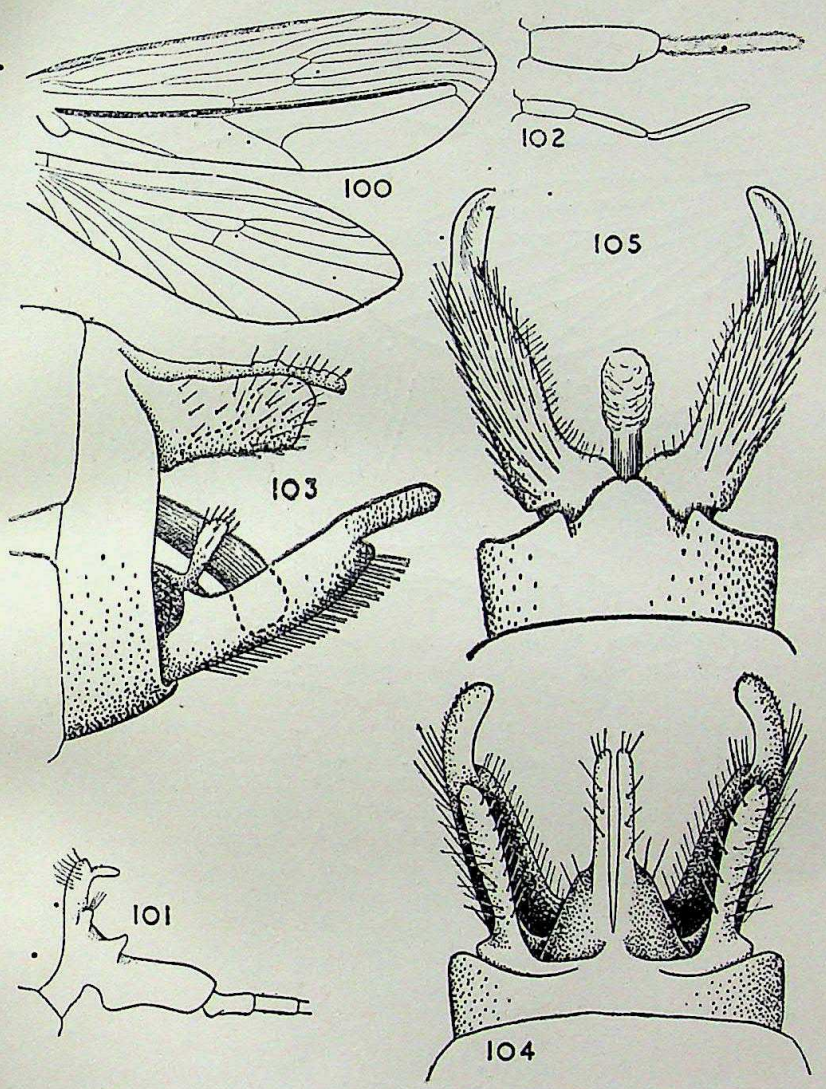
Type and paratype ♂ in the collection of the British Museum.

Anacruncecia timbaka sp. n. Figs. 106-111.

Insect brown. In the ♂, antennae with the basal joint short, very stout, with a stout, hooked process at its base, on which is seated a pair of short bars, parallel with each other; maxillary palpi densely clothed with hairs, difficult to make out, probably with two broad joints; wings covered with hairs and small, whitish scales; post-costal fold very conspicuous, fringed with long hairs

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

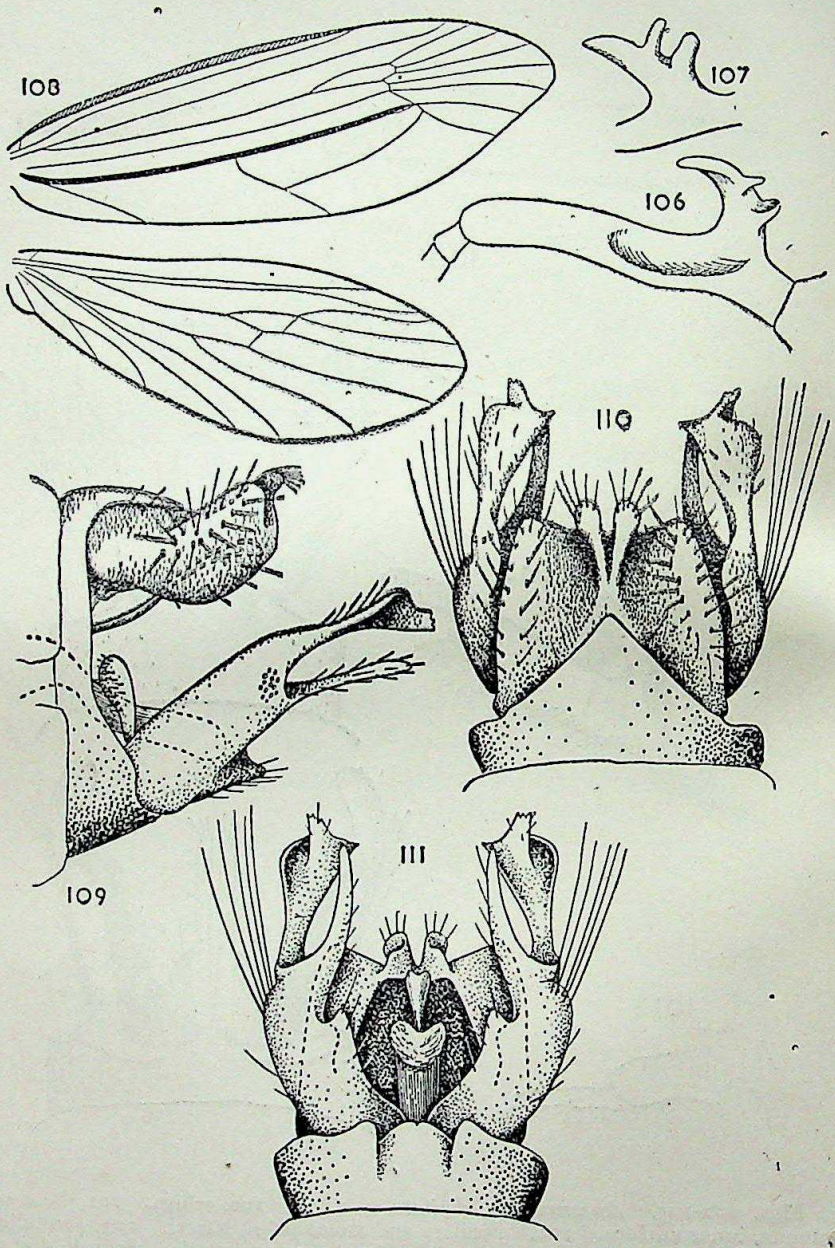
Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 100–105. *Anacrunoecia digitata* sp.n. ♂. 100, wings. 101, base of antenna, inner surface. 102, maxillary and labial palpi, lateral. 103, genitalia, lateral. 104, genitalia, dorsal, penis omitted. 105, genitalia, ventral, dorsal plate omitted.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 106–111. *Anacrunoecia timbaka* sp.n. ♂. 106, base of antenna, inner surface. 107, process at base of antenna from another aspect. 108, wings. 109, genitalia, lateral. 110, genitalia, dorsal. 111, genitalia, ventral.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and extending considerably more than half-way along the wing, three large cellules between it and the posterior border.

Genitalia ♂.—Apical margin of the ninth tergite much produced; dorsal plate broad, centre forming a raised V-shaped process; immediately beneath the centre of the plate is a slender-stemmed process, possibly an upper penis-cover with a dilated and excised apex; no apparent penis-sheaths; penis short and sinuous; inferior appendages branched and single-jointed, a branch with a dilated apex arising from the upper margin near the base and partially concealed within the segment; apex bifurcate, upper fork, from above and from the side, with a much dilated apex of complicated shape; lower fork slender, slightly shorter than the upper; from beneath, there are angular projections of the lower margin of the appendages about midway; ventral margin of the ninth sternite sinuous and excised.

Length of the anterior wing ♂ ·9 mm.

Length of the basal joint of the antenna 1.8 mm.

N.-E. Burma: Kambaiti, 4-8. vi. 1934, R. Malaise.

Burma: Ruby Mines, 5,500-7,000 ft., 1890.

Type ♂ (Kambaiti) in the Stockholm Museum, paratype ♂ (Ruby Mines) in the British Museum collection.

Dinarthrella Ulmer.

Dinarthrella Ulm., Genera Insect., fasc. 60a, p. 108, 1907.

Spurs, 2, 4, 4. In the ♂, basal joint of the antennae long, armed with a single and simple branch, sometimes rudimentary, situated at its base. Maxillary palpi two-jointed, basal joint stout and curved, terminal joint very small. Martynov's figure of *D. betteni* shows only one joint curved up in front of the face. Wings clothed with hairs and scales; in the anterior there is a fold but scarcely in the post-costal region. It passes through the centre of the wing so that it is completely separated from the lower marginal cellules which form a parallel and diminishing series from the base to the apex. Inferior appendage branched at its apex, the branch arising at the base is directed distally rather than upwards.

Genotype.—*D. destructa* Ulm.

Dinarthrella betteni Martynov. Figs. 112-116.

Dinarthrella betteni Mart., Rec. Ind. Mus., 38, pp. 286-288, figs. 57-59 a-c, 1936.

'1 ♂. Eastern Himalayas, Pashok, Darjeeling district, 3,500 ft., 1-12. x. 17, F. H. Gravely (in spirit).'

'The specimen is young and pale; colouring in fully adult specimens would be darker.'

'Head pale, clothed with dense pale, greyish-yellow hairs, with some admixture of brownish ones near the eyes. Basal joint of the antennae as long as the thorax, slender, sinuate from the side, pale, densely clothed above and beneath with dense, slender, erect, rufous brownish hairs; on the distal portion the hairs become paler, yellowish-grey; basal portion of the joint ending in a short triangular process or projection; thread pale yellow.'

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

'Maxillary palpi long, pale, adjacent to the head, curved upwards, their ends are situated between the bases of antennae and bear here a dense tuft of brownish-yellow hairs. Labial palpi long; 3rd joint longer than 2nd, which in its turn is longer than first. Thorax yellow, mesonotum elongated, twice longer than the metanotum, brownish, with two rounded pale marks bearing tufts of pale erect hairs; behind them two more small whitish spots. Metanotum brownish. Legs pale yellowish. Anterior wings pale, narrow; costa thick; subcosta running near to it, in its basal part apparently uniting with it with dense series of yellowish hairs turned backwards; this series is continuous with the hairs arising from costa. R straight, thick; RS originating early from it and forming a narrow and short discoidal cell, concealed by hairs, starting from M and therefore not easily distinguished. Only the basal part of M may be discerned, since its further part is concealed by a long and distinct anal fold, extending from the base up to the end of M_1; from the base of M and from the fold arise forwards dense series of brownish-grey hairs as in *Dinarthrella destructa* Ulm. Venation behind this fold is much disturbed as in *D. destructa*; three branches of M, CuA_1, CuA_2 and CuP connected basally and forming series of parallel (except CuP) veins; in the proximal part of wing there is only A_1, which is oblique, straight; jugal lobe rounded. Venation in posterior wings similiar to that in *Dinarthrella* sp. Betten, 1909.'

'Abdomen pale brownish, tergites provided with dark transverse (slender) thickenings at their anterior edges; 1st tergite broad, brownish.'

'♂. Side pieces of 9th segment with straight hind edges; sternite narrow with a small median projection; tergite forming a broad projection narrowed behind and reaching the base of the median excision of 10th segment, broad both from above and from the side; one may distinguish here, as in *Dinarthrum*, one median and two lateral portions; side portions short, irregular, hairy, separated from the median by two broad excisions, in which two more minute processes may be seen. Median portion also short, but with a rounded excision divided into two irregular projections, broad from side, narrower from above.'

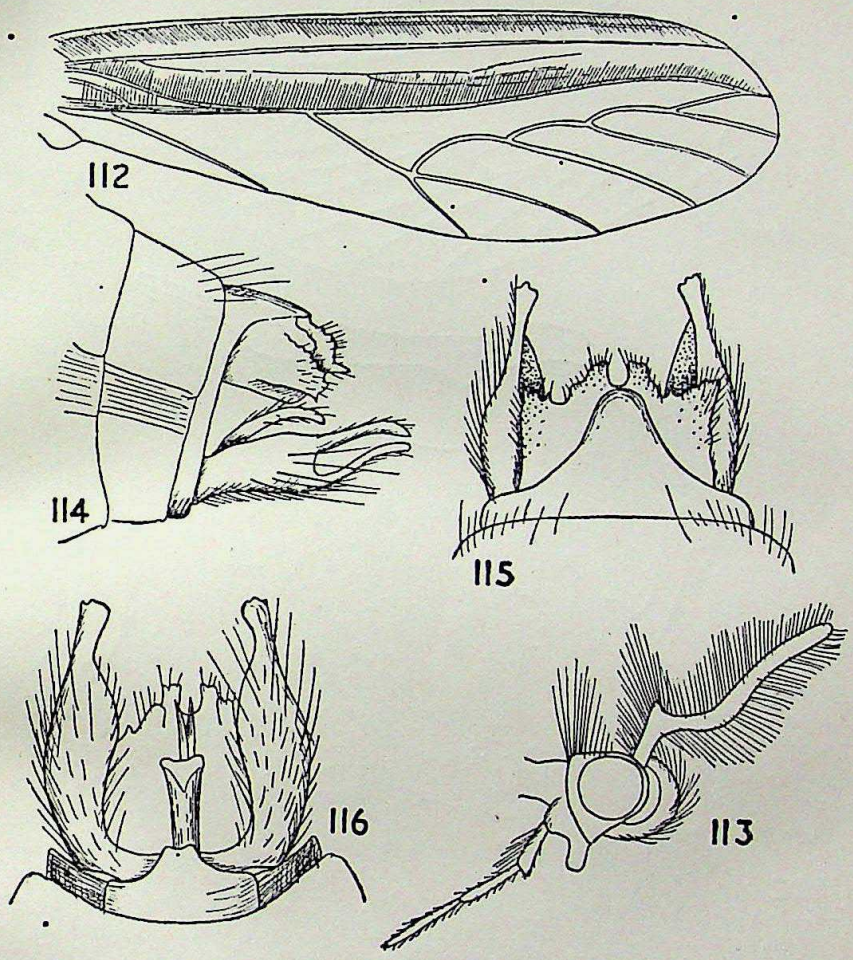
'Pedes genitales broad from the side, hairy, divided near the middle into two branches, upper and lower, the lower being more slender and bearing beneath dense greyish brown hairs; seen from beneath the pedes genitales are dilated in the middle, then attenuated (lower branch); apices ending in two or three tubercles. From the bases of the pedes genitales arise two pale sabre-shaped processes, reaching the base of the upper branch. Penis short; above it two titillators, acute at ends.'

'Length of body 6 mm.'

'*Remarks.*—*Dinarthrella* sp. briefly described and figured by C. Betten (Rec. Ind. Mus., 3, p. 241, pl. 18, figs. 10-12, 1909) belongs probably to this species, although there is some difference in the shape of the basal joint of antennae and in the venation of the fore wings. DC and its branches are almost invisible in our specimen, but it is young, Rs and M are here very pale and weak

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

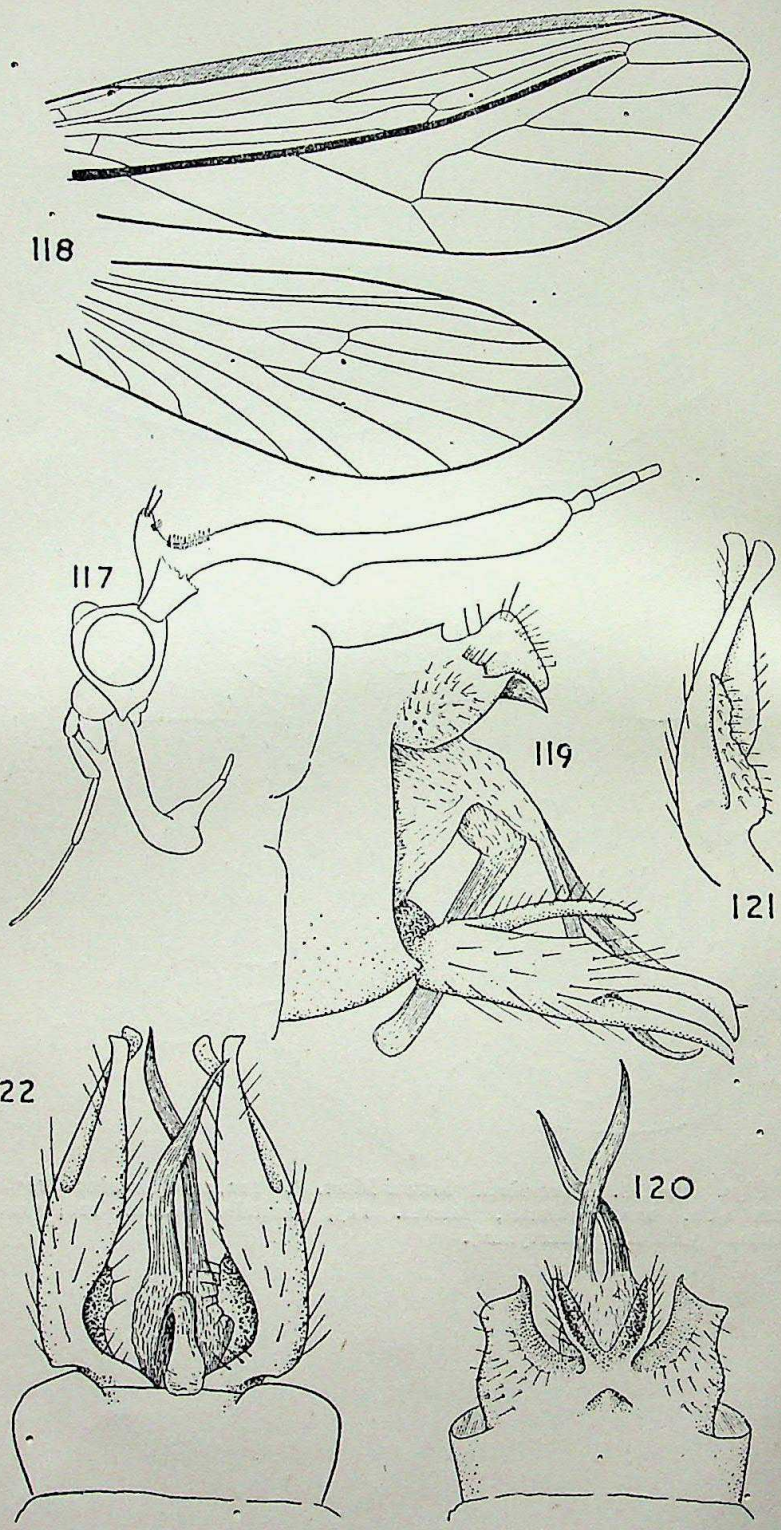
Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 112–116. *Dinarthrella betteni* Mart. ♂. 112, anterior wing. 113, head from side. 114, genitalia, lateral. 115, genitalia, dorsal. 116, genitalia, ventral. (All after Martynov).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 117–122. *Dinarthrella destructa* (Ulmer). ♂. 117, head from side. 118, wings. 119, genitalia, lateral. 120, ninth segment, dorsal plate and penis sheaths, dorsal. 121, inferior appendage, dorsal. 122, genitalia, ventral.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and therefore indistinct; Betten's figure of the basal joint of antennae is perhaps not quite correct (Betten's specimen was in bad condition). *Dinarthrella betteni* Mart. is evidently allied to *D. destructa* Ulm. from Darjeeling, but distinct.'

Dinarthrella destructa Ulmer. Figs. 117-122.

Maniconeura destructa Ulm., Notes Leyd. Mus., XXVIII, pp. 28-29, figs. 35-36, 1906.

Dinarthrella destructa Ulm., Gen. Insect., fasc. 60a, p. 108, pl. 15, fig. 130, 1907.

The type, in the Paris Museum, is in very poor condition and it was necessary to pass the head and abdomen through caustic potash before an examination could be made. One pair of wings was removed and denuded for the purpose of this re-description and this procedure no doubt accounts for any discrepancies between the figures here given and those of Dr. Ulmer, made from the undenuded wing.

Insect brownish. Description of the ♂; basal joint of the antenna long, slightly elbowed midway, without any processes but with a strong angular projection at the base carrying three or four long spines; there is a second but smaller angular projection at the point where the joint is elbowed; maxillary palpi membranous, with a long basal joint sharply bent and somewhat dilated rather beyond midway; beyond the bend, the joint is constricted, making a slender terminal portion followed by a very small second joint; wings, anterior with a narrow rim at the costa bent over onto the subcosta; the anterior part of the wing is clothed with scales and hairs; through the centre of the wing there is a heavy fringed fold, somewhat of a different character to folds in other species of the *Lepidostomatinae* and approaching the formation of a groove; beneath the fold, the neuration is very abnormal and the vestiture is confined to hairs with no apparent scales; posterior wing with normal neuration; fourth apical cellule extending not quite so far inward as the basal angle of the discoidal cell.

Genitalia ♂.—Ninth dorsal segment produced in a triangular prominence, beneath which is a broad dorsal plate bearing two broad outer wings, with sinuous outer margins as seen from above, and truncate apices, of which the inner apical angles are slightly produced; from the side these angles appear as triangular processes with acute apices directed downward; between the outer wings is a pair of diverging plates set on edge, from the side shaped like a blunt foot, toes directed downward, the sole of the foot forming an obliquely truncate apex; penis short, directed downward with a pair of long, sinuous, asymmetrically-twisted sheaths; inferior appendages single-jointed but three-branched, from the side, with a stout base terminating in two branches somewhat resembling a lobster's rather slender claw; the third branch, which from above has a dilated and serrated inner margin, is seen, from the side, to arise from the upper margin of the appendage towards the base.

Length of anterior wing ♂ about 9 mm.

Length of basal joint of the ♂ antenna 2.8 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Darjeeling: Harmand, 1890.

Type ♂ in the collection of the Paris Museum.

I am much indebted to Dr. L. Berland, of the Paris Museum, who kindly allowed me to make preparations of the various parts of the type for the purpose of this description.

An example from N. E. Burma, Kambaiti, 6,800 ft., 8. iv. 1934, R. Malaise, belongs here.

Ulmerodes gen. nov.

Dinarthrodes Mosely nec Ulmer, *J., Bombay Nat. His. Soc.*, 41, p. 334, 1939.

Spurs 2, 4, 4. In the male, the basal joint of the antenna armed with two processes, one at the base, the other towards the middle. Maxillary palpi two-jointed, basal joint generally curved, terminal long and slender. Wings clothed with hairs and scales; in anterior wing, discoidal cell long and narrow; post-costal fold about half the length of the wing, sometimes less. Penis sheaths present. Inferior appendages trifurcate at the apices, with an upright branch arising at the base.

Genotype.—*Dinarthrum armatum* Ulmer.

Ulmerodes armata (Ulmer) Figs. 123-128.

Dinarthrum armatum Ulmer, Ann. Naturh. Mus. Wien, 20, p. 69, figs. 28-30, 1905.

Dinarthrodes armata Ulmer, Gen. Insect. fasc. 60a, p. 106, 1907.

Insect brownish. In the ♂, wings clothed with hairs and scales; post-costal fold short, less than half the length of the wing; only two cellules between it and the posterior margin, the distal the longer; basal joint of the antenna long with two processes, the longer at the base, the shorter about midway; maxillary palpi two-jointed, first joint with a sharp elbow, second slender, longer than the first.

Genitalia ♂.—Dorsal plate produced in three slender processes of about the same length, one at each angle and the third at the centre; the lateral are set at a lower level than the central process and, seen from the side, have sharply elbowed bends towards their bases; the central process arises from a wide base whose lateral margins are produced downward in deep keels; penis short and curved; sheaths straight, parallel, with very acute apices; inferior appendages branched, a short, upright branch on the upper margin at the base; apex of the appendage trifurcate, the upper fork short, curved and slender, the lower pair of about the same length, lying parallel, the lower, from the side, the stouter.

Length of the anterior wing ♂ 9 mm.

Length of the basal joint of the antenna ♂ 2 mm.

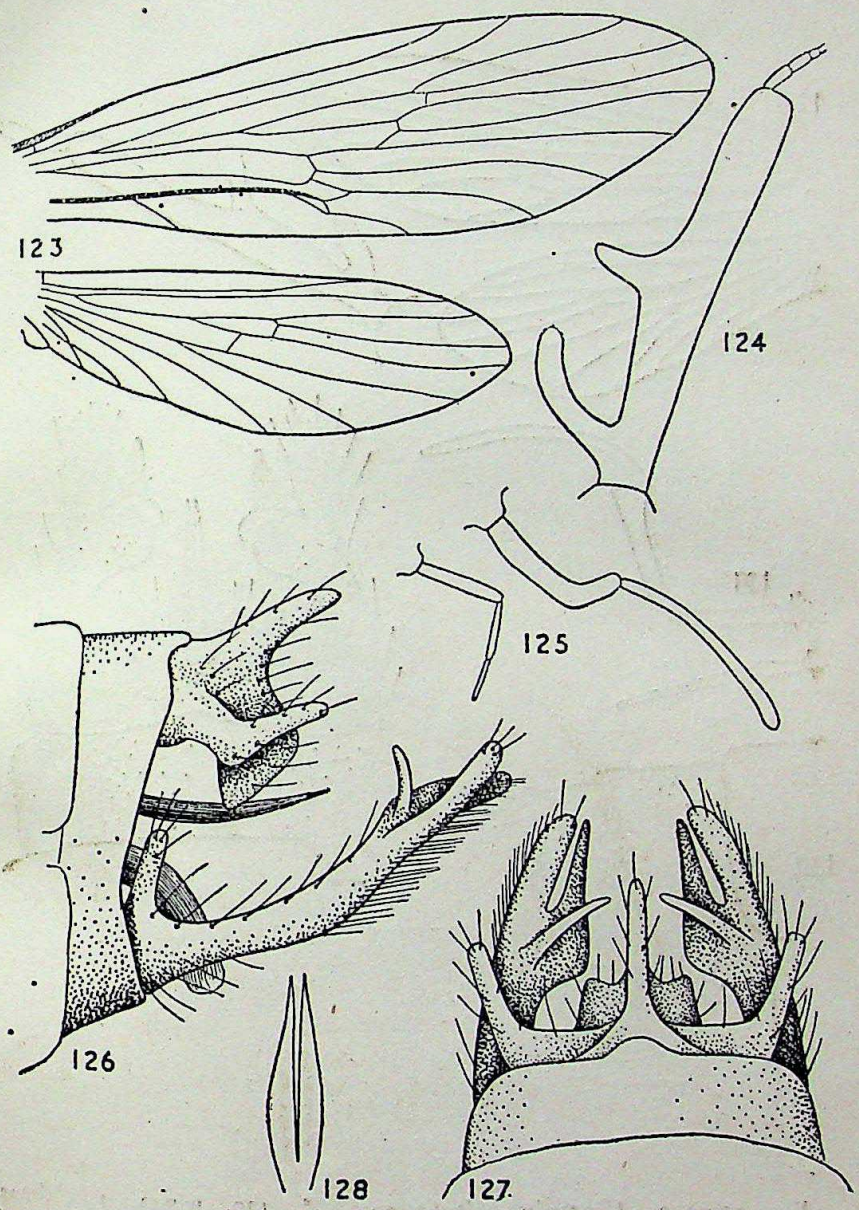
Assam.

Type ♂ in the collection of the Vienna Museum.

I am indebted to Dr. Zerny for permission to examine and refigure the type.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

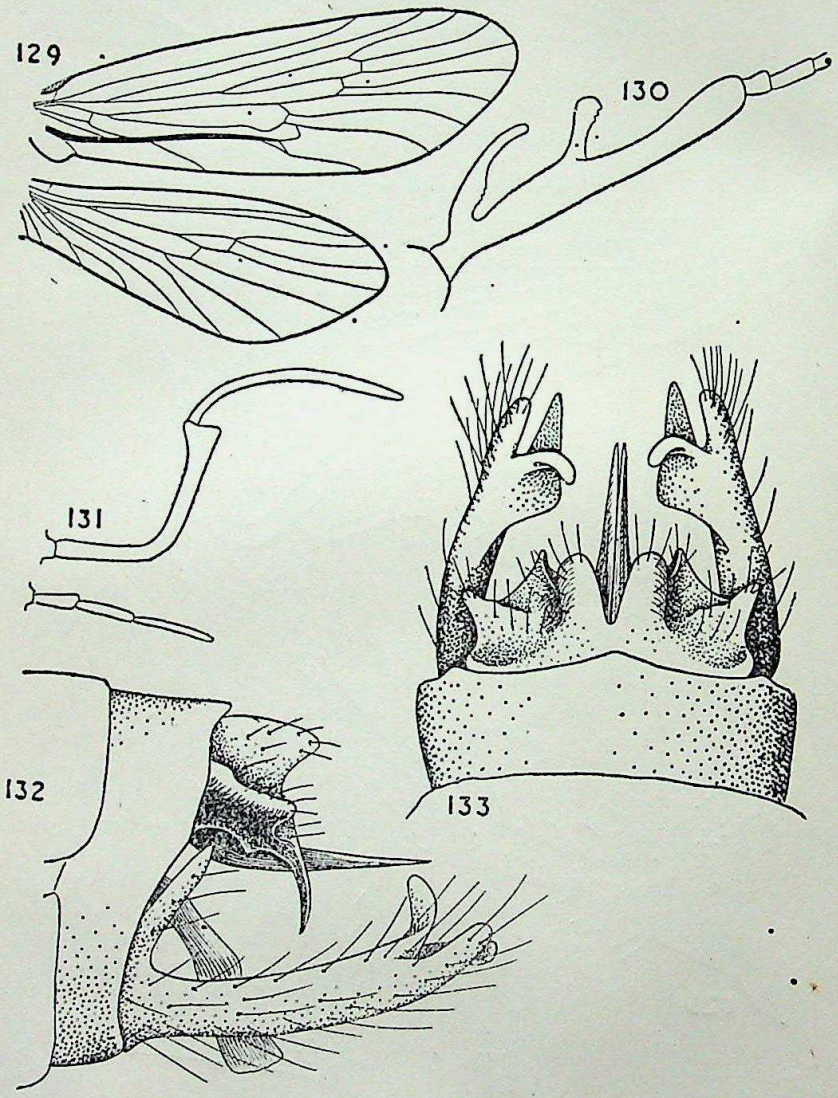
Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 123–128. *Ulmerodes armata* (Ulmer). ♂. 123, wings. 124, base of antenna. 125, maxillary and labial palpi, lateral. 126, genitalia, lateral. 127, genitalia, dorsal. 128, penis sheaths, dorsal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 129–133. *Ulmerodes palpalis* sp.n. ♂. 129, wings. 130, base of antenna. 131, maxillary and labial palpi, lateral. 132, genitalia, lateral. 133, genitalia, dorsal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

V. 48/3 590.15 B63J 48,918
Digitized by Arya Samaj Foundation Chennai and eGangotri

Ulmerodes palpalis sp.n. Figs. 129-133.

Insect brown; wings broad, clothed with hairs and scales; anterior with the discoidal cell very long and narrow, longer than its footstalk; post-costal fold reaching as far as the middle of the discoidal cell and terminating at the border of the large seventh apical cellule; posterior wing with fork No. 1 sessile; basal joint of the antenna moderately long, longer than the width of the head with the oculi and armed with a pair of stout processes, the one at the base longer than the second, which is situated about halfway up; maxillary palpi unusually long, longer than the basal joint of the antenna, two-jointed, slender, basal joint elbowed and perhaps a little longer than the terminal; spurs of the anterior tibiae prominent.

Genitalia ♂.—The apical margin of the ninth tergite slightly produced at its centre; beyond it, from above, is a coronet-shaped plate, middle process rather stout, intermediate processes produced in downcurving spines, outer processes short and directed outward; penis short; sheaths long and slender, parallel, lying well above the penis; inferior appendages single-jointed and four-branched, basal branch long and slender, concealed, arising from the upper margin at the base, directed upward; the three other branches are all at the extremity of the appendage and from beneath, the lower is the broadest.

Length of the anterior wing ♂ 8 mm.

Length of the basal joint of the antenna 1.84 mm.

N.-E. Burma: Kambaiti, 30. iv, 25. v., 1. vi. 1934, R. Malaise.

Upper Burma: Nam Tamai Valley, 16. viii, v. 1938, R. Kaulback.

Type ♂ (Upper Burma) in the collection of the British Museum, other ♂ paratypes in the Stockholm and British Museum collections.

Ulmerodes tibama sp. n. Figs. 134-138.

Insects brown. In the ♂, wings covered with hairs and scales; in the anterior, the post-costal fold rather more than half the length of the wing, with only two conspicuous cellules between it and the posterior margin, the distal cellule the larger; antenna with the basal joint long, two processes at its base, the distal the shorter and situated slightly before the middle; maxillary palpi two-jointed, joints about equal in length, basal joint irregular in shape, terminal arising before its apex.

Genitalia ♂.—Dorsal plate with the centre strongly produced in a pair of finger-like processes almost touching each other, apices slightly dilated and rounded; they arise from the centre of a wide, rectangular plate with a sinuous apical margin; lateral margins sloping to a lower level than the central, and with the angles forming small, finger-like projections directed distally; lower margin produced in a narrow, downwardly pointing plate with an obliquely truncate apex; the base of each of the central processes of the plate is produced at its lower margin in a deep keel; penis short and straight, sheaths long, apices divergent; inferior appendages

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

branched, a slender branch arising from the upper margin near the base, directed upward; apex of the appendage trifurcate, lower fork triangular with an acute apex, middle fork slender, outer rather stouter and strongly fringed.

Length of the anterior wing ♂ 9 mm.

Length of the basal joint of the antenna ♂ 2.44 mm.

N.-E. Burma: Kambaiti, 7,000 ft., 1. vi. 1934, 11. v. 1934 24. v. 1934, R. Malaise.

Type ♂ in the collection of the Stockholm Museum. Paratypes ♂ in the British Museum collection.

Goerodella gen. n.

Spurs, 2, 4, 4. In the ♂, basal joint of the antenna long with either a simple branch at its base or else the rudiments of such a branch. Maxillary palpi two-jointed, the basal joint sometimes with a membranous branch or swelling at its apex, terminal joint slender. Wings clothed with hairs and scales; in the anterior, post-costal fold very short, about a third the length of the wing; in some species the costa is folded over the wing for nearly its entire length. Penis sheaths long. Inferior appendage furcate at its apex and with a basal branch less erect than usual, practically directed distally.

Genotype, *G. tesarum* sp. n.

Goerodella cornuta sp. n. Figs. 139-144.

The species is very similar to *Goerodella tesarum,* but with slight differences in neuration, particularly in the post-costal fold area. The membranous maxillary palpi are difficult to make out and may possibly differ slightly in the two species. Small differences are also apparent in the form of the basal joint of the antenna.

In the ♂ genitalia, the claw-shaped lateral angles of the dorsal plate are more accentuated in *cornuta* and, viewed from the side, there is a serrate ridge proceeding downward from the centre of the dorsal plate. Other parts are very similar in the two species which I consider, nevertheless, to be distinct.

Length of the anterior wing ♂ 10 mm.

Length of the basal joint of the antenna 3.3 mm.

N.-E. Burma: Kambaiti, 9. iv. 1934, 6,800 ft.; 30. iv., 24. vi., 12. vii., 1934, 6,300 ft., R. Malaise.

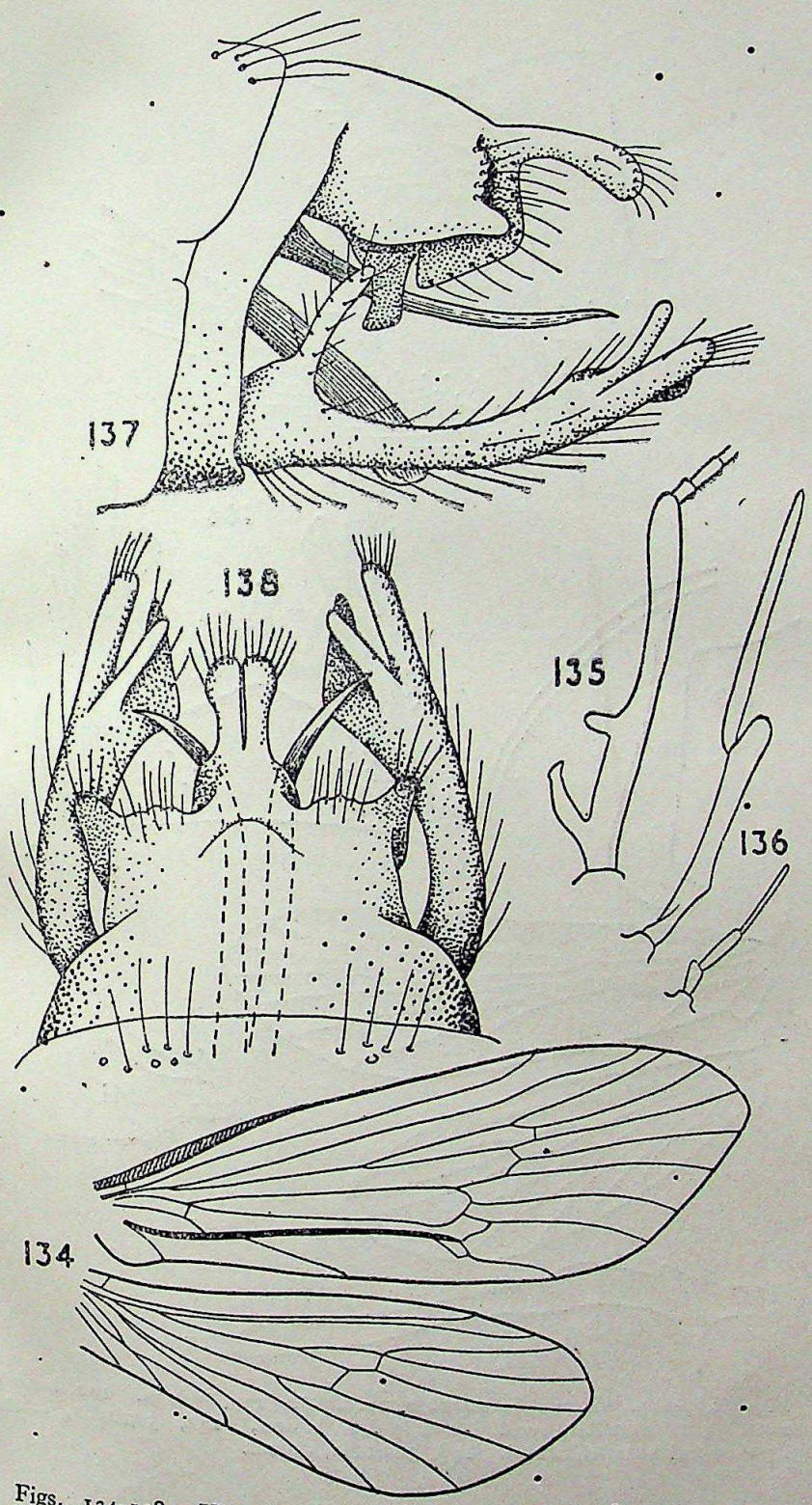
Type ♂ (30. iv. 1934) in the collection of the Stockholm Museum. Paratype ♂ in the British Museum collection.

Goerodella ramosa sp. n. Figs. 145-151.

Insects yellowish brown. In the ♂, wings covered with hairs and scales; anterior with a short post-costal fold, less than half the length of the wing, with one large cellule beneath it, besides a smaller in the anal region; fork No. 2 extending beneath the discoidal cell nearly halfway; no central fold; costa not folded over; basal joint of the antenna not very long, with a stout branch towards the base, whose apex is truncate with the lower apical angle

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

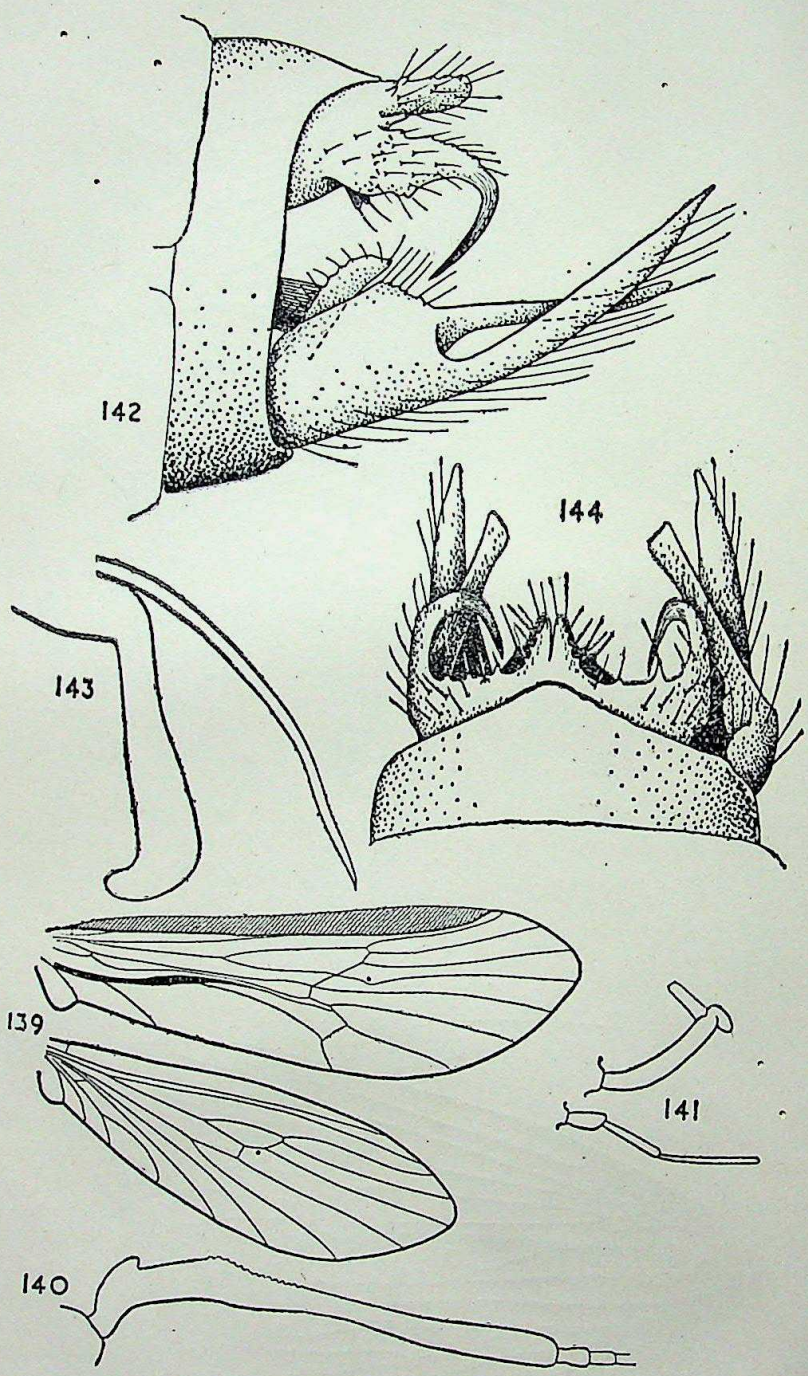
Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 134–138. *Ulmerodes tibama* sp.n. ♂. 134, wings. 135, base of antenna. 136, maxillary and labial palpi, lateral. 137, genitalia, lateral. 138, genitalia, dorsal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 139–144. *Goerodella cornuta* sp.n. ♂. 139, wings. 140, base of antenna. 141, maxillary and labial palpi, lateral. 142, genitalia, lateral. 143, penis and sheaths, lateral. 144, genitalia, dorsal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

48918

(from above) produced in a short claw; maxillary palpi membranous, rather narrow, apparently two-jointed but there is no very definite joining point; the second joint appears rather as a membranous extension of the centre of the basal joint towards its apex; there is a slight dilatation of the membrane at the extreme apex of the second joint, possibly the rudiments of a third.

Genitalia ♂.—Dorsal plate with the centre of its apical margin raised in a pair of ridges which, from above, appear as small central processes; at the base of these ridges, the plate is broadly extended on each side, apical margin circularly excised, outer angles forming acute claws, inner, triangular processes whose lower margins are produced to form acute, down-pointing spurs as seen from the side; penis short and rather retracted in the type; sheaths long, acute and parallel; inferior appendages branched, a slender branch arising from the upper margin towards the base, directed upward; apex of the appendage bifurcate, upper fork with its apex concave, lower fork more slender and finger-like.

Length of the anterior wing ♂ 8 mm.

Length of the basal joint of the antenna ♂ 1.7 mm.

N.-E. Burma: Kambaiti, 7,000 ft., 24. v. 1934; 25. v. 1934; 12-17. vi. 1934, R. Malaise.

Type ♂ in the collection of the Stockholm Museum. Paratypes ♂ in the British Museum collection.

Goerodella tesarum sp. n. Figs. 152-156.

Description of the male; general appearance fuscous; basal joint of the antennae fuscous, slightly elbowed midway, without any processes at the base, but with a strong, angular projection carrying three or four large spines or spurs at the place where processes, when present, are generally situated; there are two other patches of spines on the inner surface of the base of the joint, the patch nearer the base, short, the second patch, long and slender; apex of the basal joint slightly dilated, terminal joints ochraceous; maxillary palpi two-jointed, basal joint long, dilated in a membranous sac towards the apex; beyond this the joint is sharply bent, second joint short; labial palpi, basal joint short and stout, second longer but shorter than the third; wings fuscous, with dark scales mainly confined to the nervures; anterior with no central longitudinal groove, costa folded over the sub-costa along its entire length; the fold in the post-costal region short, curving sharply upward, three cellules along the posterior border, the basal cellule the smallest and the median, the largest; in the posterior wing, the fourth apical cellule extends further inwards than the base of the discoidal cell; a long pencil of yellow, silky hairs arising from the anal angle legs ochraceous.

Genitalai ♂.—Ninth tergite produced at its centre in a broad-based triangle, beyond which is a wide, dorsal plate produced and excised at the centre to make a pair of triangular processes, outer angles produced and triangular, with the apices of the triangles produced again in long, downwardly directed spines or spurs; penis short, straight; sheaths asymmetric but not directed to one side

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

as in the *Dinarthrum* species; inferior appendages single-jointed, bifurcate from about midway, upper fork rather more slender than the lower, about equal in length, apex clavate, lower fork with the apex sinuous; a third branch arising from the inner surface towards the base; lower margin of the ninth segment with a central excision, and a triangular projection opposite the base of each appendage.

Length of the anterior wing ♂ 10 mm.

Length of the basal joint of the antenna 3.3 mm.

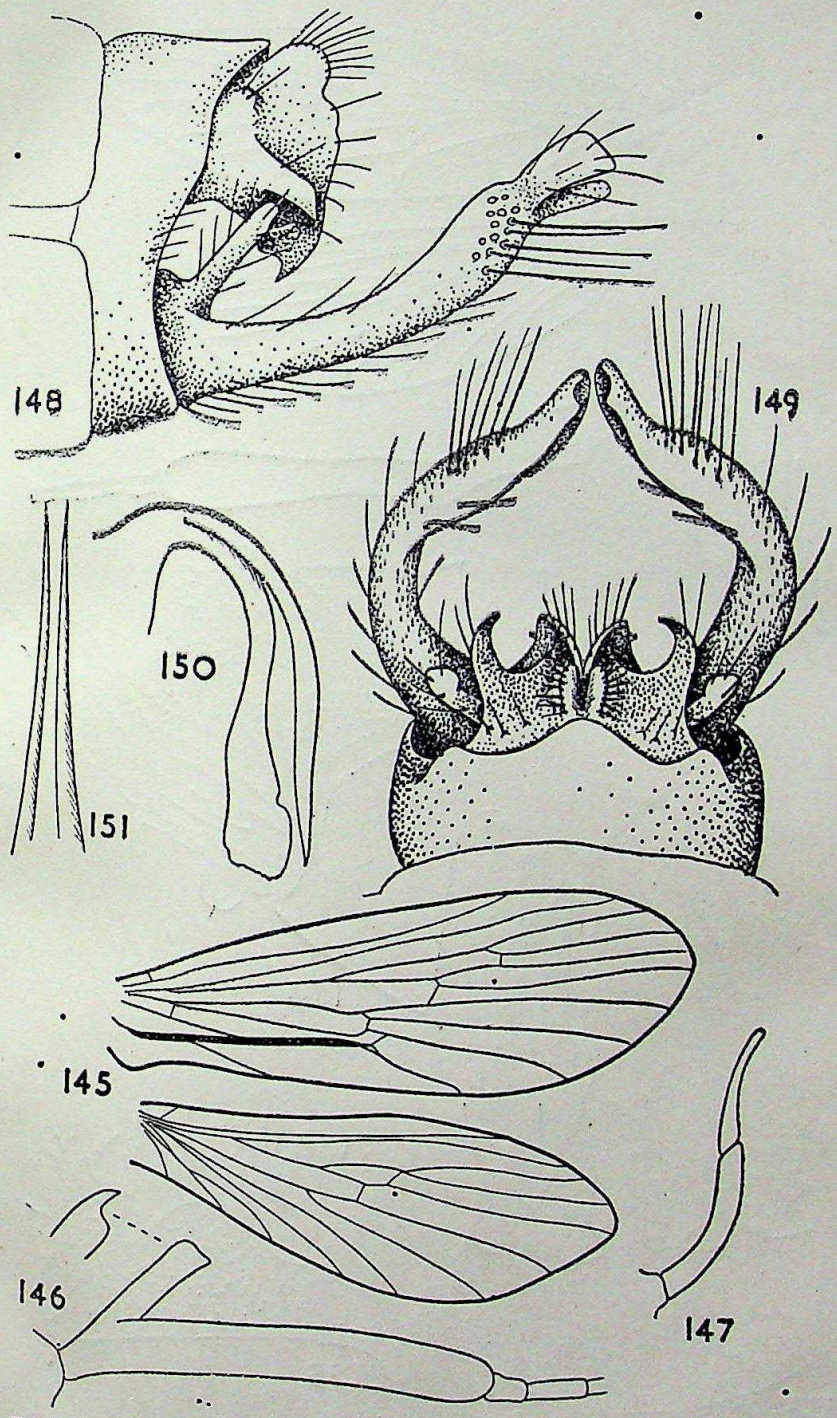
Kumaon: Muktesar, 7,500 ft., 29. ix. 1922, Fletcher Collection.

Type ♂ in the collection of the British Museum.

(*To be continued*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

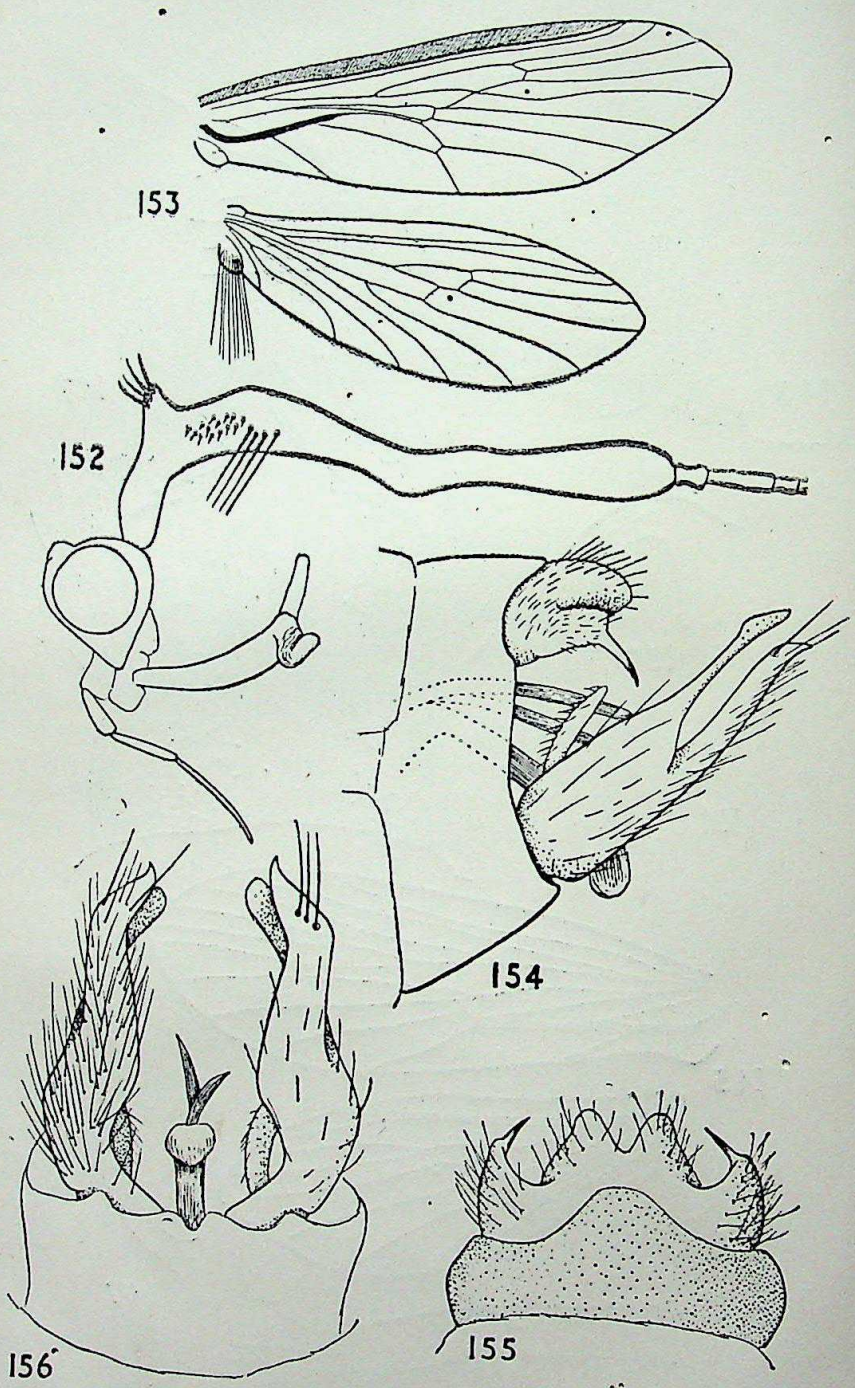
Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 145–151. *Goerodella ramosa* sp.n. ♂. 145, wings. 146, base of antenna, with inset of apex of process, dorsal. 147, maxillary palpus, lateral. 148, genitalia, lateral. 149, genitalia, dorsal. 150, penis and sheaths, lateral. 151, penis sheaths, dorsal.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



Figs. 152–156. *Goerodella tesarum* sp.n. ♂. 152, head from side. 153, wings. 154, genitalia, lateral. 155, ninth segment and dorsal plate, dorsal. 156, ninth segment, inferior appendages and penis, ventral.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SEX RATIOS IN INDIAN BATS

BY

HUMAYUN ABDULALI

In Vol. 47 of the *Journal* (No. 3, p. 522), I wrote a note on bat migration in India and referred to the book by Norbert Casteret which prompted the enquiry. I have now had access to a new book by the same author 'My Caves' (J. M. Dent & Sons Ltd., London, 1947) in which the last chapter is called 'Three Years With The Bats' and contains some additional information which should be of interest to naturalists in this country.

Reference is made to some caves on the French side of the Pyrenees where three species of bats exist; *Rhinolophus* (Horse-shoe bats), *Miniopterus* (probably *M. schreibersi*) (Long-winged bat) and the larger *Myotis myotis* (Mouse-eared bat) which is the mainstay of his study. These three species are a little confused in the English translation and we have only been able to sort them out with the assistance of Mr. R. W. Hayman of the British Museum.

Casteret's observations were first undertaken in November when there were a dozen *Rhinolophs* or Horse-shoe bats which remained in the caves through the winter months in a state of almost absolute torpor. On 5th April numbers of the larger Mouse-eared bat arrived and 225 bats, captured with butterfly nets, were ringed with aluminium cylinders slit on one side, which were gently closed over the bat's *fore-legs* (probably mis-translation for fore-arms) so that they could still slide up and down. With the arrival of migrants the *Rhinolophs* almost disappeared.

In the evenings, the Mouse-eared bats did not leave the cave all together like a flock of birds, but the first exit was noted about 20 minutes after sunset, five bats leaving in five minutes. Subsequent departures were counted over 5-minute periods and one set of figures recorded is 5, 11, 14, 25, 63, 135, 197 and 260. After reaching this maximum the rate diminished to 131, 58, 16 and 4; the last 4 left 55 minutes after the first.

It is suggested that bats exude oil from their nose glands which they rub on to their wings as protection against climatic conditions. This process is impracticable while in their crowded roosting (day) positions. It has to be gone through when the 'swarm' breaks up in the evening and the individuals have more room to move about and apply their toilette. It is said that one bat, hanging head downwards as usual, was seen to go through a lengthy process of folding and unfolding its membranous wings and drawing them with a slow sweeping movement across its nose.

These bats stay till August and their numbers vary between 400 and 1,000—the larger the number the longer it took to empty the cave, which really remained completely deserted only for two hours. Their return was spread over a much longer period than

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the exit time, probably depending upon their success in hunting insects.

They are sensitive to changes of weather. Cold, wind and rain may restrict or completely suspend their exodus. Every year at the beginning of June they leave their homes earlier in the evenings in some cases only 10 minutes after sunset.

Of the thousands of *Myotis* handled and ringed over several years, Mr. Casteret did not come across a single male and believes that the mating must have taken place in autumn at some other place, gestation commencing only in spring. 'The caves in the Pyrenees are therefore a maternity home where the young ones are born at the same time, almost all on the same day. . . . In the swarm, the young can sometimes be seen crawling over the tangle of bodies, burrowing into the mass with plaintive squeaks, in order to be fed by other females. So highly developed is the herd instinct in these bats that the mothers appear to have no recognized off-spring. It is difficult to accept the view that hundreds of nurses on their return from hunting can recognise their own babies in the swarm of small bodies. . . . I have often separated babes from mothers and entrusted them to other females and the adoption has followed at once.'

It is recorded that when the young are 25 to 30 days old 'the mothers cannot fly about with so heavy a burden and when night comes they bite their babies to make them let go. The latter protest loudly and the din is deafening. At last when they have been duly chastened, that is to say nipped, they cling to the corrugations of the roof and the mothers go off on their nightly flight alone. For two or three hours the cave then contains nothing but the infant population. They are a rowdy lot and keep up a continual chirping like that of chicks.'

Males born in the caves never come back while the young females will return every year with their mothers and, later with their daughters, the same individuals having returned to the caves for three years.

While the spring arrival is spread over six or seven days, a general departure in a single night seems to take place about 20th August.

Their arrival coincides with that of the first swallows and it is suggested that they fly with the birds. The following instances are quoted:

'A German naturalist, Otto Hepp, had noticed on a fine autumn afternoon in 1890 a number of bats among a flight of swallows crossing the river Main about two hundred feet above it. Otto Hepp was a serious student but a very old man. No one doubted his sincerity, but it was thought his eyes had played him false.

'However, on 25th September 1933 two other German naturalists, von Finkenstein and Schafer, were amazed to see a similar phenomenon near the small lake of Ullersdorf in Upper Lusatia. In an hour and a half they counted some five hundred bats flying with some house-martins towards the south.'

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

'Finally, in October 1935, M. G. Hugues, son of the eminent and late-lamented French naturalist, Albert Hugues, detected bats flying with swallows against a dark sky at Romans in Drome.'

As further evidence of their migration 165 bats were ringed at a place about 10 miles from the cave in a direct line and individuals from this flight obtained at the caves on the following morning. A further release of 65 *Myotis* from a distance of 22½ miles also resulted in 8 of these being recovered at the caves three days later. A third release of 120 bats at a distance of 60 miles yielded no result for some time, but a month later several 'returns' were collected. Several other releases were made at varying distances and the furthest return was over a distance of 165 miles in a straight line. The time between release and return is not however indicated but these interesting facts will only go to show how much is still unknown about the habits and movements of these small mammals which are so near to us.

There is of course more information about European bats (e.g. in 'A History of British Mammals, by G. E. H. Barrett-Hamilton) but the material from the Caves book is summarised merely to give readers in India an indication of possibilities of work in our area. Except for a few notes in Blanford's Fauna, our information is non-existent. Blanford states that in 'temperate regions bats hibernate in winter, a number of them being frequently found huddled together. Some observers have supposed that no hibernation takes place in India but the insectivorous forms in Northern India at all events, are but rarely seen abroad during the cold season though the *Pteropodidae* are as active as at other times'. Subsequent to this, under several species e.g. *Rhinolophus luctus* and *affinis*, Capt. Hutton is quoted as stating that 'in Mussoorie they appear only during the warmer months of summer, remaining in a semi-torpid state during the winter.'

The haunts of bats are usually well marked, and regular notes kept over any length of time in different places should give us some information, though of course the ringing method would always be the most reliable.

Mr. Casteret's reference to the absence of males in the caves examined by him has prompted me to go through the records of the Mammal Survey conducted by the Bombay Natural History Society many years ago. An analysis has been made of the specimens obtained during this survey and we find that of a total of 5609 specimens collected only 39% were males. A detailed statement of the same is appended herewith. It will be noticed that in 25 species the males are in a minority ranging from 14.7 to 47% while the average of various species (consisting mostly of those forms of which less than 10 specimens were obtained) the male percentage is also only 42.8.

In only two species i.e. *Hipposideros lankadeva* and *Taphozous melanopogon* do the males exceed the females. In the last species the figures appear to be clear that there is always a preponderance of males, and it is curious that this is the only species in which there is

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

a marked external sexual difference between the sexes i.e. the beard of the male.

The specimens were obtained over a large number of camps (about 50 separate collections are listed) ranging from Ceylon, through Kanara, Mysore, Poona, Gujerat, Kathiawar & C.P. into the Kumaon and Eastern Himalayas and then down into Burma.

In the following table the first figure in parenthesis after the name indicates the number of different camps from which this

SEX RATIO IN SPECIES OF BATS OBTAINED BY THE SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON

Species	Males	Females	% Males
1. Rousettus seminuda (1, 0) ...	5	29	14·7%
2. Rousettus leschenaulti (9, 0) ...	55	97	36·0%
3. Myotis peytoni (1, 0) ...	7	35	16·6%
4. Rhinopoma hardwickii (13, 2) ...	47	129	26·7%
5. Rhinopoma kinneari (7, 2) ... (both at Jamnagar and in Cutch only 11 males each were obtained.)	33	68	32·6%
6. Rhinolophus lepida (8, 0) ...	28	67	29·4%
7. Rhinolophus rouxi (8, 3) ...	43	85	33·5%
8. Hipposideros fulvus (27, 0) ...	99	228	30·0%
9. Hipposideros speoris (8, 1) ...	118	197	37·4%
10. Hipposideros armiger (10, 3) ... (once 15 males to no females in Nepal)	89	123	42·0%
11. Hipposideros larvatus (2, 1) ...	73	91	44·5%
12. Hipposideros lankadeva (4, 3) ...	34	29	53·9%
13. Taphozous longimanus (15, 2) ...	63	137	31·5%
14. Taphozous melanopogon (11, 10) ... (except for 11 females only at Rajkot and 19 males only at Kanara, both sexes were obtained in all areas)	142	68	67·6%
15. Cynopterus sphinx (23, 2) ...	61	127	32·4%
16. Tylonycteris pachypes (8, 0) ...	13	27	32·5%
17. Megaderma spasma (12, 1) ...	30	58	34·0%
18. Hesperopterus tickelli (4, 0) ...	7	13	35·0%
19. Lyroderma lyra (24, 1) ... (once 39 males to 24 females)	168	299	35·9%
20. Pipistrellus mimus (27, 6) ... (12 females to no males in Gujerat)	149	228	39·5%
21. Pipistrellus ceylonicus (15, 1) ...	54	81	40·0%
22. Pipistrellus coromandra (19, 2) ...	112	150	42·7%
Miscellaneous species ...	429	572	42·8%
23. Scotophilus kuhli (26, 3) ...	143	210	40·5%
24. do. wroughtoni (15, 3) ...	101	146	40·9%
25. Laponicteris kachensis (11, 2) ...	91	131	40·9%
26. Scotozus dormeri (10, 1) ...	28	35	44·4%
27. Nyctinomus tragatus (5, 0) ...	8	9	47·0%
TOTALS ...	2,230	3,469	39·1%

species was collected, and the second the number of occasions on which the males exceeded the females. This is indicated only when the total of specimens of a species from a camp is over 5. The various species listed are from all the four sub-families of bats

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

represented in the Old Fauna and this preponderance of females seems to be a condition which affects the whole family. A further investigation into the habits and social lives of the many species, particularly of *Taphozous melanopogon* (there is a colony in the main cave at Kanheri, near Bombay) would be of considerable interest.

Hodgson is reported to have observed that in *Lyroderma lyra* the males greatly exceed the females, but in view of our figures (obtained over 24 camps) it is perhaps permissible to assume that his collections were made from male colonies. It is apparently customary for the two sexes in many bats to live apart except in the pairing season (Old Fauna p.258).

After compiling the above we have noticed a passage on page 39 of 'A History of British Mammals' reading:

'Many naturalists, from Spallanzani downwards, have referred to a supposed preponderance in number of the female sex. On this point no satisfactory evidence is forthcoming, but the apparently superfluous size and capacity of the male generative organs would be accounted for if it could be shown that bats are polygamous.'

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

SPECIATION IN THE GROUP OF GREAT REED-WARBLERS

BY

E. STRESEMANN AND J. ARNOLD

(With a plate and 6 text-figures)

THE PROBLEM

Many difficulties involved in the classification of closely similar forms have disappeared after the eminent importance of isolation as a factor in evolution had been correctly understood. The formula 'similarity coupled with geographical separation' has since been accepted as the touchstone of trinomialism by an increasing number of taxonomists, and whenever that condition is fulfilled two compared forms are considered members of the same species or 'Rassenkreis'.[1]

In contrast to 'geographical separation', the concept of 'similarity' is a very elastic one, and there have been, in recent years, quite a number of authors who indulged in its utmost extension, because they wanted to reduce the number of species as much as possible. By employing this method they expected to serve the demand for simplification of the system. Simplification has in fact been the result, simplification however at the expense of incontestability. The fundament of the judgment thus attained, often rather airy, cannot be based on precise facts, but merely on the hypothesis that the two compared forms, separated by a distributional gap, would *probably* hybridize if meeting each other.

When wanting to support such a theory one should, however, not only point to the similarity of the forms in question, but it seems of equal importance to emphasize the characters by which they differ, and to examine the biological value of these differences, not only of colour and structure, but also of ecology, behaviour, food, moult, migration, and so on. Many large 'circles of races' which have been constructed within the last ten or twenty years will shrink again when ornithologists become better acquainted with the biology of the forms at present connected by taxonomists for convenience only.

Assertions cannot be disproved by assertions. Such cases therefore deserve to be treated in some detail for which it can be shown that the principle of simplification has been overdone.

An example of that kind is furnished by the Great Reed Warblers which range from the Baltic Sea and the Amur river down to Australia. These were divided in 1909 by Hartert into three species: (1) *Acrocephalus arundinaceus* (*arundinaceus* + *zarudnyi* + *orientalis*); (2) *Acrocephalus stentoreus* (*stentoreus* + *brunnescens*); (3) *Acrocephalus australis*. In 1924 however, when reconsidering the matter, Hartert came to the following result: (1) *A.*

[1] Rassen = races, Kreis = circle.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

arundinaceus (*arundinaceus* + *zarudnyi*), (2) *A. stentoreus* (*stentoreus* + *brunnescens* + *orientalis* + *australis* and the rest of the Indonesian forms).

Soon afterwards Salomonsen (1929), progressing in the same direction, merged all these forms into one single 'Rassenkreis' which had to bear the name *Acrocephalus arundinaceus*. His view has been accepted by Hartert and Steinbacher (1934), by Dementjew (1935), by Stresemann (1940) and quite recently by Mayr (1948).

In spite of this consensus of experienced taxonomists the arrangement proposed by Dr. Salomonsen cannot be maintained, as shown by our map from which it becomes apparent that two forms are co-existing along the eastern border of Lake Aral and its affluent, the Lower Syr Darya. Though this fact, emphasized by its discoverer Sarudny in 1916 already, has been mentioned by Salomonsen, he seems to have known it from second hand only; otherwise his map of distribution and his systematic conclusions would have been in better accord with reality. Sarudny had taken a small boat to explore the eastern shores and islands of Lake Aral after reaching it by the delta of Syr Darya. From 28 June to 26 July, 1914, he collected birds at many spots down to his turning point, the mouth of the Dshany-darya. He condensed his experiences in the following notes:

'*Acrocephalus arundinaceus zarudnyi* is one of the commonest birds in the reeds covering the delta of the Syr Darya. He occurs in great numbers at lake Kamyshly-bash and lake Tshe-bash. We found him equally frequent among the reed thickets of Kuiljus. Further southwards we met him along the eastern shore of Lake Aral and the opposite islands as far as the estuary of the Dshany-darya; but beginning with the reeds of the islands Dambaly, Silyawa, Dshurpass, and Menshikow he becomes far less frequent than *A. a. brunnescens*, and in the estuary of the Dshany-darya (25-26. vii.) he seems to be rare.

Acrocephalus arundinaceus brunnescens. During our voyage from north to south along the eastern shore of Lake Aral, this form was first met with by us in the reeds of the delta of the Syr-Darya (28. vi.), where it breeds in very insignificant numbers, hardly making itself apparent amidst the masses of *A. a. zarudnyi*.

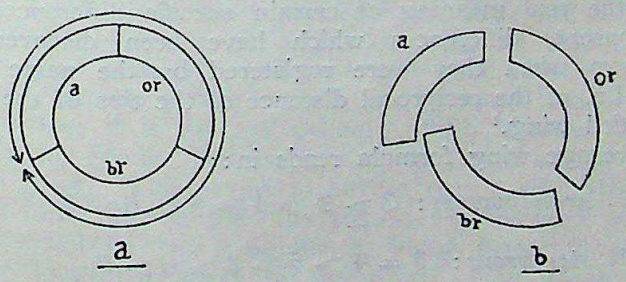


FIG. 1 (for explanation see p. 439)

Further to the south it becomes more and more frequent, being already common on the island Atalyk, though still outnumbered by *A. a. zarudnyi*. But starting with the islands Dambaly, Dshurpass

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and Menshikow, besides on Uyaly and Usun-Kain, the reverse becomes true more and more, to the effect that *A. a. zarudnyi* has to be considered here of rare and (perhaps) casual occurrence.'

These remarks ought to have forced Dr. Salomonsen to accept at least two species of Great Reed Warblers instead of a single one only. Our distrust, once awoken, did not stop at this point. We thought it advisable to examine anew the relations of all forms

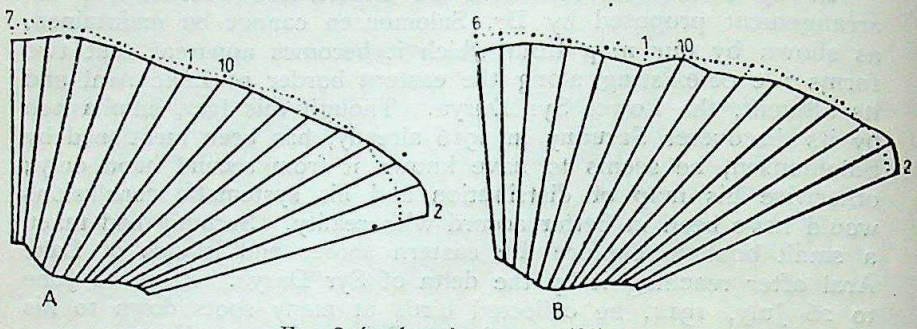


FIG. 2 (explanation on p. 439)

to their geographic neighbours. The result is herewith presented to the judgment of ornithologists.

It may be stated in advance that we consider certain differences of wing structure to be of considerable phylogenetic age, i.e. those which are shown in our figures 2 A and 2 B. Accordingly we feel induced to accept three species of Great Reed-Warblers:

(1) *Acrocephalus arundinaceus*, with the races *arundinaceus*, *zarudnyi* and *griseldis*.

(2) *Acrocephalus stentoreus*, with the races *stentoreus*, *brunnescens* and the Indonesian group.

(3) *Acrocephalus orientalis*.

WING STRUCTURE

The wing structure is best shown by expanding the fore limb. If through this procedure the quills are given their functional position, the real meaning of certain specific differences will become apparent, differences which have been discovered many decades ago when they were registered by the name of 'wing formula', i.e. of the reciprocal distance of the tips of the primaries in the folded wing.[1]

The average wing formula reads in:

A. arundinaceus: $3 \geqq 2 > 4 > 5 > 6 > 7$

A. stentoreus: $3 = 4 > 5 > 2 > 6 > 7$

A. orientalis: $3 > 2 \geqq 4 > 5 > 6 > 7$

[1] As far as we know, the German ornithologist J. H. Blasius (1840) was the first author to use the wing formula as a diagnostic character in birds.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The outline of the expanded wing of *A. arundinaceus*, *A. stentoreus* and *A. orientalis* is shown in the figures. For this purpose three specimens were selected which agreed in tarsal length and, therefore, may have been of equal body weight.[1] The wing area of these three specimens is almost the same, the outline however different, *A. arundinaceus* having a longer wing tip and shorter secondaries if compared with *A. stentoreus*. In this regard, *A. orientalis* stands between the two other species.

Fig. 3 shows the difference in formation of 'slots'.[2] Let us first examine the *outer web* of the distal primaries. In *A. arundinaceus* it is only the 3rd primary which is distinctly emarginated in its distal third and thus becomes a 'finger', while it is the 3rd and 4th in *A. stentoreus*. Functionally linked with this difference is the difference in outline of the *inner web*. The occurrence of a (more or less distinct) notch of the inner web is restricted to the 2nd primary in *A. arundinaceus*, while it occurs on the 2nd and 3rd in *A. stentoreus*. *A. orientalis* represents an intermediate stage in this respect also.

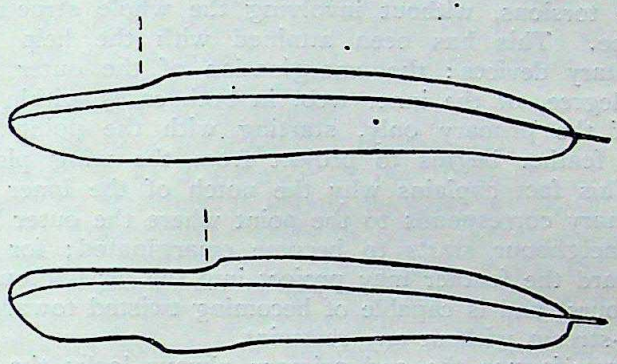


FIG. 3 (explanation on p. 439)

In order to understand the meaning of these structures it is indispensable to call to mind what is known about the dynamics of a wing stroke (for details see Graham, 1930 and Sick, 1937). During the down-beat of the expanded wing all distal primaries become pronated passively, and their tips bent upward, as clearly shown in K. Zimmer's slow motion film (Zimmer 1943, tab. xiv). In Passeriformes it is the 2nd primary which is most exposed to the twisting air forces, because it can lean itself at the rear only and not in front. This seems to be the reason why the 2nd primary tends to be shorter than the 3rd even in 'pointed' wings; the latter, supported by two neighbours, being better fitted for becoming the longest primary of the wing. The advantage of a 'blunt' wing, in which the 5th or 6th primary surpasses the 2nd, 3rd and 4th, probably consists in its greater stability during the

[1] The body weight of Great Reed-Warblers seems to be unrecorded, with the exception of *A. arundinaceus arundinaceus*.

[2] This term has been adopted here from Graham, 1930, *q. v.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

down-beat; this advantage however is gained at the expense of propulsory effect.

Passive twisting of the free 'fingers' offers an aerodynamic advantage: for 'fingers' rigidly projecting from the wing plane would not fail to cause aerial eddies counteracting the propulsory forces. Only if twisted in pronatory manner do they attain a position relative to the passing air in which both useful components, the uplifting as well as the propulsory force, are greatest (Zimmer 1943, fig. 8).

It is significant that only the tip of the wing, broken up into individual 'fingers', becomes subject to these aerodynamically favourable torsions, without involving the whole structure of the wing plane. This has been attained with the help of certain supplementary devices: the emargination of the outer web, and, to some degree, of the inner web, in both cases within the distal portion of the primary only, starting with the point where the respective feather begins to project from the wing plane like a finger. This fact explains why the notch of the inner web of a given primary corresponds to the point where the outer web of its proximal neighbour starts to become emarginated; for from this mark onward the feather may project into the air without touching its neighbours, and is capable of becoming twisted towards the line of the air-stream without any restraint.

In Passeriformes the 2nd primary always lacks the emargination of its outer web, because there is no distal neighbour to lean on. It is only from the 3rd onward that this device is found. In migratory species it tends to be best developed in the 3rd and 4th, and in such a case the inner web of the 2nd and 3rd shows a 'notch', besides being more or less distinctly emarginated.

We consider all differences of wing structure which have been found to exist between *A. arundinaceus* and *A. stentoreus* to be morphological expressions of differences in the use of the wing. This interrelation seems obvious with regard to the difference of outline. All races of *A. arundinaceus* are known to be true migrants which cover great distances twice a year, while the races of *A. stentoreus* are either sedentary or migrants to a far lesser degree only. The former group had therefore to develop a more 'pointed' wing: In connection with increased need for propulsory efficiency of its beat the wing had to become longer. The simplest means of meeting this demand consists in increasing the length not of the distal wing bones, but of the distal primaries (2nd to 4th), which thus become a longer propulsing lever. Apparently this is a reversible process: if less intensely used again, the wing tip tends to become more rounded, with the 5th and 6th primary increasing in length at the expense of their distal neighbours.

It seems probable that some functional explanation will one day be given also for the other differences, that exist between the wings of *A. arundinaceus* and *A. stentoreus*—differences not only of the number of 'slots', but also of their length. Such a theory will have to be supported by the study of analogous cases which are furnished by other species of well-known habits.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Systematic Position of the Forms *griseldis*, *orientalis* and the Indonesian Group.

(1) *griseldis*. (We have not been able to examine a specimen and therefore are compelled to rely on literature only). This form, though agreeing with *arundinaceus* in wing structure, shows so many differences in other respects that Ticehurst (19) decided to treat it as a separate species. It lacks the faint striping of the throat, the tail is shorter and more graduated, the bill longer, the colour and relative size of the eggs, and in addition the shape of the nest, are said to be quite distinct from *arundinaceus*. The breeding range seems isolated from that of other Great Reed-Warblers. We feel inclined to consider *griseldis* an early offshoot of the *arundinaceus*—branch, and therefore employ the symbol *Acrocephalus* (*arundinaceus*) *griseldis*.

(2) *orientalis* has been judged by earlier authors, including Hartert 1909, to be a subspecies of *arundinaceus*; in 1924 however Hartert treated it as a member of the 'Rassenkreis' *stentoreus*. With regard to structure it stands between *A. arundinaceus* and *A stentoreus brunnescens*, while in colour of plumage it hardly deviates from *A. arundinaceus*. The colour of the feet is said to differ from *A. arundinaceus* as well as from *A. stentoreus*, by being more bluish or lead gray, less brownish gray. Whereas Stegmann (1929) claims its song to be absolutely the same as that of *A. arundinaceus*, it has been declared by Jahn (1942, p. 158), from his experiences in Japan, to differ considerably, chiefly by lacking the trenchant *Karre-kiet* component.

The breeding range of *orientalis* seems to be isolated from both its neighbours *A. arundinaceus zarudnyi* and *A. stentoreus brunnescens*. For lack of nature's experiment we think it advisable to leave the question of affinity undecided and to give this form the rank of a separate species, *Acrocephalus orientalis*.

(3) *The Indonesian forms*. A group ranging from the Philippines to Southern Australia and New Britain. All Indonesian Reed-Warblers are closely related to each other, differing chiefly in size and relative length of bill. 3rd and 4th primary emarginated as in *A. stentoreus*. Wing very 'blunt', the primaries 3, 4, 5 being equal in length and longer than the 6th, 2nd, 7th.

This assemblage may be regarded as an offshoot of the *stentoreus*-branch which reached the Philippines via Formosa and thence spread to Celebes, the Lesser Sunda Islands, Australia, etc. (see map).

Complete isolation of many small populations has favoured the evolution of races, which however tend to be rather faintly differentiated. From this fact it may be concluded that the Great Reed-Warbler started its conquest of Indonesia not earlier than during late Pleistocene times, after having given rise to some ancestral form which, owing to the effect of tropical climate, had decreased in size and, owing to its strictly sedentary habits, had acquired a rounded wing.

We agree with previous authors (Hartert 1924, Stresemann 1924) in judging all Indonesian races to be members of the species *Acrocephalus stentoreus*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Migration

The forms treated in this article are partly sedentary, partly migratory.

All Reed-Warblers breeding within the tropical zone are strictly sedentary, i.e. most forms of the Indonesian group and the southern populations of *A. stentoreus brunnescens*. Besides, *A. stentoreus stentoreus* stays all the year round in Palestine and Egypt.

The northern populations of *A. stentoreus brunnescens* differ in this respect from the more southern ones by performing migrations to distances of 1,000 km (or even more). The same seems to hold true in Australia, where the southern populations of the local Reed-Warbler are known to leave their breeding range in autumn. In both cases the wing structure of migratory and non-migratory populations is still the same. We may argue from this fact that the difference in habits is of relatively short tradition.

A. orientalis and all subspecies of *A. arundinaceus* (including *griseldis*) are true migrants which pass the off-season in some rather distant tropical area (see fig. 4).

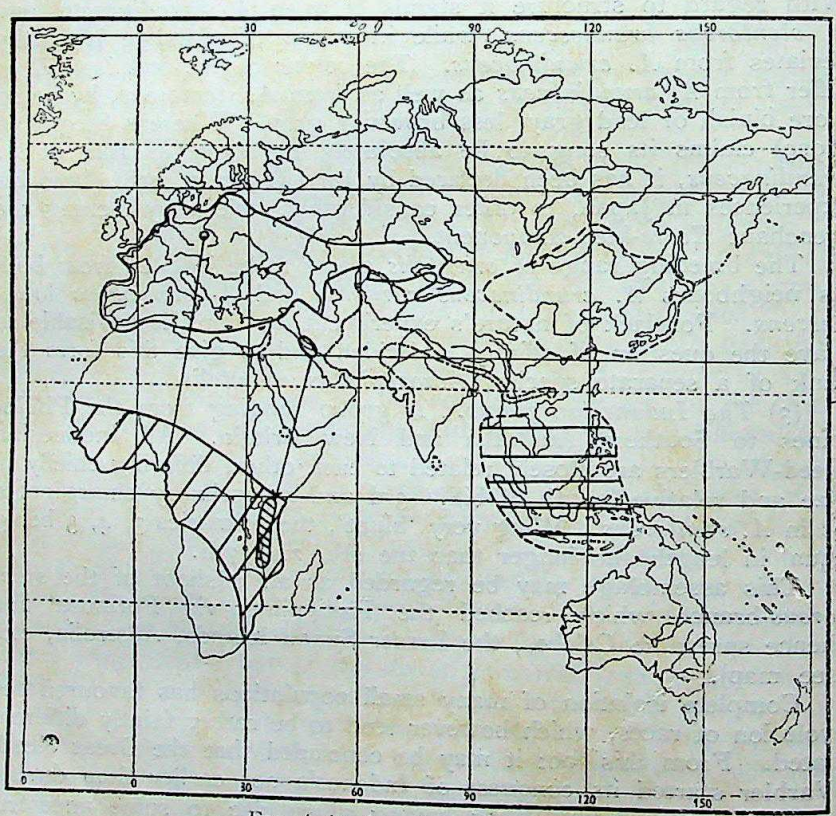


Fig. 4 (explanation on p. 439)

In order to reach their winter quarters the European populations of *A. arundinaceus* seem to migrate in a southern direction[1], while

[1] Our map (fig. 4) shows two points of the migration route of a specimen ringed on 1. vii. 1935 in Geppersdorf (Silesia) and secured 5. iv. 1937 Nbasi (Nigeria), 5,280 km. distant. (Creutz, 1937).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Photo *R. S. P. Bates*

Indian Great Reed-Warbler (*Acrocephalus stentoreus brunnescens*) on nest

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the Asiatic populations have to follow a more or less southwesterly course. A remarkable crossing of flight lines takes place in the Amu Darya region and Persia, where *A. arundinaceus zarudnyi*, arriving from the Tarim basin and tending towards East Africa, meets *A. stentoreus brunnescens* which directs its flight to the Mekran coast or N.W. India.

Moult

The general moulting scheme followed by all Great Reed-Warblers seems to be:

Nestling plumage (followed by body moult at the age of a few weeks, beginning soon after leaving the nest), first autumn plumage (followed by first complete moult at the age of about 6 months), first annual plumage (followed by second complete moult at the age of about 1½ years), second annual plumage, etc.

All migratory forms apparently undergo the first complete moult in winter quarters; as a rule, this moult seems to take place at a later date than the complete moult of adult specimens. According to Whistler (in Ali and Whistler, 1936) *brunnescens* changes all the plumage only once a year, from September to November. The same may be true for *A. arundinaceus* and *A. orientalis*, though this assumption is not in accordance with that of Witherby (1938) who supposes *A. arundinaceus* to undergo two complete moults in Africa, one after arriving there and a second before spring migration. The matter needs to be studied anew.

Ecology

All Great Reed-Warblers agree in the construction of the nest (a very deep cup with strong walls, the edges of which are slightly bent inward) which may be regarded as an adaptation to the effect of wind in reed belts. (Plate) They are typical inhabitants of the latter, favouring the reeds even in winter quarters. There are exceptions, however.

In Lower Egypt and in Southern Palestine *A. stentoreus stentoreus* may be found in *Papyrus* swamps, and on islands in the southern Red Sea even in mangroves. Heuglin (*J. f. O.* 1868, p. 136) discovered a nest in the fork of a mangrove bush (*Avicennia officinalis* L.) at the height of 1 meter, its cup being somewhat shallower than in the case of reed-nesting *A. arundinaceus*. The same ecological change has been recorded from the Mekran coast, where *A. stentoreus brunnescens* has become an inhabitant of mangrove forests and been supposed to construct its nest in the branches (Ticehurst, *Ibis* 1922, p. 549). The *tertium comparationis* between reed belt and mangrove forest consists in the presence of water covering the ground.

Originally the reverse process seems to have given rise to the ecological specialisation of the Reed-Warblers, for they are in all probability descendants of some group of bush-haunting warblers (closely related to the present genus *Hippolais*) which show some degree of preadaptation to nesting within the reed belt by their method of fastening the nest to branches or stalks.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

History of Dispersal

The original home of the true Reed-Warblers (*A. arundinaceus* *A. stentoreus*; *A. orientalis*, *A. scirpaceus*) may have been some region which, by being poor in bushes and rich in reeds, offered special advantage to certain pre-adapted species which were able to settle in that still unoccupied ecological niche. Such type of vegetation is characteristic of the borders of great deserts; in our day it is to be found along Lake Aral and its affluents,[1] in the Kirghise steppe, round the Gobi desert, etc. We may therefore assume the very ancient dry area of Central Asia to have been the cradle of the first 'Reed-Warblers' whence they spread in various directions, founding isolated colonies of reed-haunting species.

If one wants to date the origin of the group of Great Reed-Warblers, the following considerations may be of some help.

The dispersal of the Indonesian branch of *A. stentoreus*, from the Philippines down to Australia and New Guinea, must have taken place during Pleistocene times (exactly like that of *Cisticola exilis*, *Tyto longimembris*, *Turnix sylvatica*, etc.). The time elapsed since Australia was reached by *Acrocephalus* has been long enough for allowing an increase in body size from north to south which follows 'Bergmann's rule' (Mayr 1948).

If we assume that *Acrocephalus* settled in Australia during late Pleistocene we are forced to the conclusion that *A. stentoreus* had already emigrated from the Continent to Indonesia (the Philippines) in early Pleistocene, for the Indonesian branch is far more differentiated from the continental one than the South Australian populations are from the North Australian ones. On the other hand, the morphological distance between *A. arundinaceus* and *A. stentoreus* seems to be still greater than the distance separating the tips of the two main branches of *A. stentoreus*. This being true the bifurcation of the genealogical tree into a *stentoreus*-branch and an *arundinaceus*-branch must have taken place in late Tertiary times already, and its splitting-up into those branches which gave rise to several now widely distinct species (like *arundinaceus*, *scirpaceus*, *scirpaceus*, *baeticatus*, *agricola*) at an even earlier period. (see fig. 5).

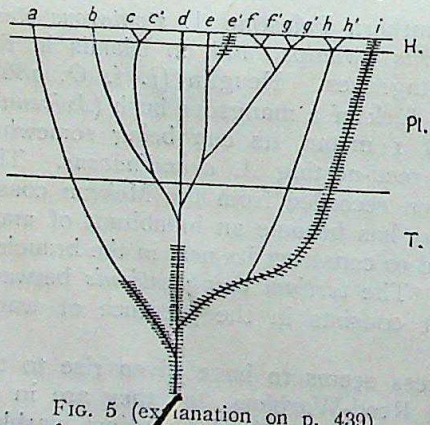


Fig. 5 (explanation on p. 439)

Calculations like this one are, however, rather inaccurate, in as much as the rate of differentiation may be largely influenced by the size of the population, being highest in very small ones.

Distribution

The ranges of the present forms of Great Reed-Warblers are restricted by bound-

[1] In this region a second genus of birds, *Remiz*, consisting of tree- and bush-haunting species, has been increased by the development of a specialized reed-dweller: *Remiz macronyx*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

aries which mostly seem to be set by ecological factors and may therefore be regarded as more or less stable. In northwestern Europe, however (and probably at other places too), matters are

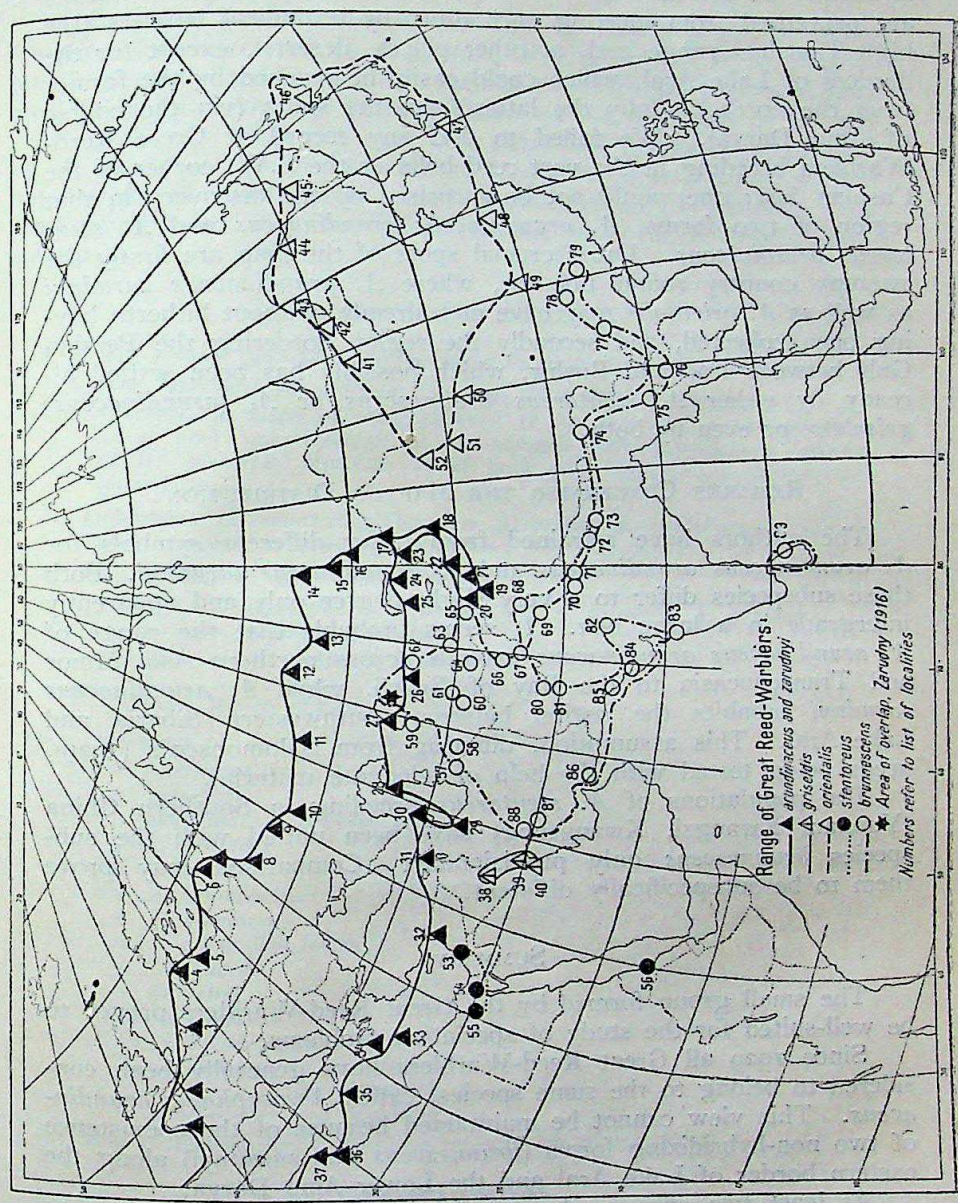


FIG. 6 (numbers refer to list of localities)

different. *A. arundinaceus arundinaceus* proves, by still expanding its range to the northwest, to be a late immigrant to that area. This bird has failed to reach England, where *A. scirpaceus* is of common occurrence in the reed belts. The Cimbric peninsula and the Danish islands have been settled by Great Reed-Warblers after 1850 only, and southernmost Sweden not before the present century.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Our map of distribution (Fig. 6) shows the fact that at several places the range of two forms, though approaching each other rather closely, are still separated by an area not inhabited by any of them. *A. arundinaceus zarudnyi* and *A. stentoreus brunnescens* are prevented from meeting each other by ecological barriers (the high Tianshan range and, at other places, deserts), except for the borders of Lake Aral, which could easily be reached by the former from the north, and by the latter from the south (via the course of Amu Darya). We failed to find any record of Great Reed-Warblers breeding in the vast reed belts at the S.W. corner of the Caspian Sea; one would not be surprised by the discovery in that region of two forms, *A. arundinaceus arundinaceus* and *A. stentoreus brunnescens*. Other crucial spots of the map are firstly the swampy country round Lob-nor, where *A. arundinaceus zarudnyi* as well as *A. orientalis* may have met already, without hitherto having been collected, and secondly the region bordering the Persian Gulf between Fao and Bushir, which possibly has been settled already by either *A. stentoreus brunnescens* or *A.* (*arundinaceus*) *griseldis*, or even by both.

Remarks Concerning the Map of Distribution

The authors have refrained from using different symbols for *A. arundinaceus arundinaceus* and *A. arundinaceus zarudnyi*. Both these subspecies differ to a very slight degree only and apparently intergrade in a large belt. It seems probable that the range of *A. arundinaceus arundinaceus* extends across northern Asia Minor and Transcaucasia to the Bay of Enzeli, while *A. arundinaceus zarudnyi* inhabits the region between southwestern Siberia and Lake Aral. This assumption, differing from Salomonsen's (1929), needs being tested with the help of adequate material.

The populations of *A. stentoreus* breeding in Southern China (Yunnan, Kwangsi, Kwangtung) have been united with the subspecies *brunnescens* only provisionally. Comparison may prove them to be subspecifically different.

Summary

The small group formed by the Great Reed-Warblers proved to be well-suited for the study of speciation problems.

Since 1929 all Great Reed-Warblers have generally been considered to belong to the same species, called *Acrocephalus arundinaceus*. This view cannot be maintained because of the coexistence of two non-hybridizing forms (*brunnescens* and *zarudnyi*) along the eastern border of Lake Aral and the Lower Amu Darya.

At least two species, *A. arundinaceus* and *A. stentoreus*, will have to be accepted. The authors decided to propose even a third species, *A. orientalis*, which forms the link between the two others, while the form *griseldis* has been (provisionally) attached by them to the species *A. arundinaceus* and the Indonesian group of races to the species *A. stentoreus*.

The chief morphological differences of the various species are to be found in the wing-formula and the emargination of the distal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

primaries, differences for which a functional explanation is offered on p. 431.

Migration, moult, ecology, history of dispersal and present distribution are briefly discussed.

The Great Reed-Warblers seem to be descendants of bush-haunting birds (related to *Hippolais*) which, forced by ecological pressure, specialized for a life in reed belts. This shift of habit may have taken place during Tertiary times on the outskirts of Central Asiatic deserts. That this may be a reversible process is suggested by *A. stentoreus stentoreus* and *A. stentoreus brunnescens*, certain populations of which have settled in mangroves (*Avicennia*), thus reassuming what may be considered the habit of a very remote ancestry.

Explanation of Figures

1. *a*. The wrong conception: three races forming one single species.
   b. The facts and the problem: two or three different species?
2. Difference in shape of wing between (2 A) *Acroceph. a. arundinaceus* (solid line) and *Acroceph. s. brunnescens* (dotted line) and between (2 B) *Acroceph. orientalis* (solid line) and *Acroceph. s. brunnescens* (dotted line).
3. Differences of emargation between *Acroceph. a. arundinaceus* (above) and *Acroceph. s. brunnescens* (below).
4. Map of Summer and Winter Range.
   ——— *Acroceph. a. arundinaceus* + *zarudnyi* + *griseldis*.
   — — — — *Acroceph. orientalis*.
   —.—.—.— *Acroceph. s. brunnescens*.
   ... ... *Acroceph. s. stentoreus*.
   Winter Range shaded.
5. Phylogeny of Reed-Warblers.
   a *baeticatus*
   b *griseldis*
   c *arundinaceus arundinaceus*
   c *a. zarudnyi*
   d *orientalis*
   e *s. brunnescens*
   e *s. stentoreus*
   f-g Indonesian forms
   h *scirpaceus*
   i *palustris*
   H = Holocene
   Pl = Pleistocene
   T = Tertiary
   bush haunting
   ——— reed haunting
6. Map of distribution. (Numbers refer to list of localities.)

List of Localities

A. a. arundinaceus + *zarudnyi*.

1. Lower Loire, Olphe-Galliard (1891).
2. Lower Seine, Olphe-Galliard (1891).
3. Holland, ten Kate (1937).
4. North Jutland, Skovgaard (1932).
5. Iddingen in Shonen, Hermanson (1943).
6. Esthonia: Nuckoe Isle, Matzahl-Wieck, O. Koch (1911).
7. Distr. Pskov, Dementiev (1935).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

8. ,, Smolensk, Pleske (1891).
9. ,, Tula, ,, ,, .
10. ,, Tambov, ,, ,, .
11. Bugurusslan, ,, ,, .
12. Shadrinsk, ,, ,, .
13. Kokchetav, Dementiev (1935).
14. Kainsk, Sushkin (1938).
15. Lake Kulunda, Johansen (1904).
16. Tarbagatai, Dementiev (1935).
17. Saissan-Nor, Pleske (1891).
18. Juldus and Tarim valley. Pleske (1891).
19. Yarkand, Hellmayr (1929).
20. Kashgar, Ludlow and Kinnear (1933).
21. Maralbashi, Hellmayr (1929).
22. Aksu, Hellmayr (1929).
23. Ala-Kul, Brehm (1882).
24. Lepsa-Mouth, Nikolski (1883).
25. Ili valley, Nikolski (1883).
26. Distr. Perovsk, Dementiev (1935).
27. Tshe-Bash, Sarudny (1916).
28. Ft. Alexandrovsk, Pleske (1891).
29. Enseli, Buxton (1921).
29 a. Resht, Witherby (1910).
30. Lenkoran, Radde (1884).
31. Aralych (Ararat), Sushkin (1914).
32. Lake of Antioch, Meinertzhagen (1935).
33. Crete, Stresemann (1943).
34. Peloponnesus, Niethammer (1943).
35. Lentini-Lake, Stresemann (1943).
36. Oud-el-Hatob, Withacker (1905).
37. Fetzara-Lake, Loche (1867).

A. a. griseldis.

38. Lake Akkarkuf (near Bagdad), Ticehurst (1922).
39. Gurmut Ali, Medina-marshes, Ticehurst (1926).
40. Fao distr., Bubian, Ticehurst (1926).

A. orientalis.

41. Tola valley, Kozlov (1933).
42. Tarei-Nor, Onon river, Stegmann (1929).
43. Argun river, Pleske (1891).
44. Seja, Stegmann (1931).
45. Ussuri, Stegmann (1931).
46. Hokkaido, Jahn (1942).
47. Kiushu, Jahn (1942).
48. Lower Yang-tse-kiang, La Touche (1925).
49. Shasi near Ichang, La Touche (1922).
50. Kantshu, Stresemann, Meise, Schoenwetter (1937).
51. Ssatsu, Pleske (1889).
52. Oasis Chami, Pleske (1889).

A. s. stentoreus.

53. Lake Huleh, Meinertzhagen (1930).
54. Near Suez, Meinertzhagen (1930).
55. Fayum and Wadi Natrum, Meinertzhagen (1930).
56. Massaua, Heuglin (1869).

A. s. brunnescens.

57. Achal-plain and Atrek-river. Sarudny (1896).
58. Geok-Tepe, Sarudny (1896).
59. Amu Darya, Moltchanov (1912).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

60. Merv, Sarudny (1896).
61. Chardjui, Sarudny (1896).
62. Karatau-Mts., Dementiev (1935).
63. Leninabad, Ivanov (1940).
64. Hissar, Ivanov (1940).
65. Daraut-Kurgan, Ivanov (1940).
    a. Goultcha, Stolzmann (1896).
66. Bamian, Whistler (1945).
67. Kabul, Whistler (1945).
68. Srinuggar, Oates (1889).
69. Gurdaspur, Currie (1916).
70. Delhi, Whistler (1931).
71. Moradabad, Whistler (1931).
72. Bahraich Distr., Whymper (1907).
73. Gorakhpur, Osmaston (1913).
74. North Lakhimpur, Stevens (1914).
75. Taunggyi, Wickham (1929).
76. Chiang Mai Plain, Deignan (1945).
77. Mongtze, Uchida and Kuroda (1916).
78. Too-Yuen (Kwei-chow), Yen (1934).
79. Yao-shan (Kwangsi), Yen (1930).
80. Kandahar, Ticehurst (1926).
81. Quetta, Ticehurst (1926).
82. Pali (Jehol), Whistler (1938).
83. Bombay, Sálim Ali (1937).
84. Eastern Nara, Oates (1889).
85. Karachi, Ticehurst (1922).
86. Jask, Ticehurst (1926).
87. Shiraz, Blanford (1876).
88. Zagross Mountains, Witherby (1903).
89. Ceylon, Whistler (1944).

Literature

Ali, Sálim and Abdulali, Humayun (1937). The Birds of Bombay and Salsette; *J. Bomb. N.H. Soc.* xxxix, p. 679.

Ali, Sálim and Whistler H. (1936). The Ornithology of Travancore and Cochin, Pt. IV; *J. Bomb. N.H. Soc.* xxxviii, No. 3.

Blanford, W. T. (1876). Eastern Persia. London p. 194.

Brehm, A. (1882). Am Ala Kul in Turkestan; *Ornithol. Centralblatt* 1882 p. 98.

Buxton, P. A. (1921). Notes on Birds from Northern and Western Persia; *J. Bomb. N.H. Soc.* xxvii, p. 95.

Creutz, G. (1937). Die bisherigen Beringungsergebnisse bei der Gattung *Acrocephalus* Naum.; *Berichte d. Vereins Schles. Orn.* 22, 1937, p. 55 ff.

Currie, A. J. (1916). Some Birds found in the Gurdaspur District, Punjab; *J. Bomb. N.H. Soc.* xxiv, p. 602.

Deignan, H. G. (1945). The Birds of Northern Thailand; *U.S. Nat. Mus. Bull.* 186, p. 483.

Dementive; G. P. (1935). Systema avium rossicarum Vol. I, Paris 1935.

Graham, R. R. (1930). Safety Devices in Wings of Birds; *Brit. Birds* 24.

Hartert, E. (1909). Die Vögel der paläarktischen Fauna I. Berlin, p. 556.

— — (1924). Uber einige neue Vögel aus dem indo-australischen Archipel; *Treubia* VI, 1, pp. 20-25.

— — u. F. Steinbacher (1934). Die Vögel der paläarktischen Fauna. Ergänzungsband, p. 265.

Hellmayr, C. (1929). Birds of the James Simpson-Roosevelt Asiatic Expedition; *Field Museum of Nat. Hist. Publ.* 263, p. 96.

Hermanson, W. (1943). De bada *Acrocephalus*-arterna i Skäne; *Fauna och Flora* 1943, p. 252.

v. Heuglin, M.Th. (1869). Ornithologie Nordost-Afrikas; Kassel Bd. I. 1 Abt., p. 287 ff.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Ivanov, A. J. (1940). Birds of Tadjikistan. *Ed. of the Acad. of Science* SSSR. Moscow—Leningrad 1940, p. 221 (russ.)

Jahn, H. (1942). Zur Oekologie und Biologie der Vögel Japans; *J. f. Orn.* 90, p. 156-158.

Johansen, H. (1904). Vorläufiger Bericht über eine im Sommer 1902 in die Kulundinische Steppe und die angrenzenden Teile des Ssemipalatinsker Gebiets unternommene Reise. *Orn. Jahrb.* xv, p. 181.

Kate, C. G. B. ten (1937). De Nederlandsche Vögels. I, 1937, p. 239.

Koch, O. (1911). Übersicht über die Vögel Estlands; Reval—Leipzig 1911, p. 73.

Kozlow, E. (1933). The birds of South-West Transbaikalia, Northern Mongolia and Central Gobi. *Ibis* 1933, p. 312.

La Touche, J. D. D. (1922). The Birds of the Province Hupeh. *Ibis* 1922, p. 453.

La Touche, J. D. D. (1925). Handbook of the Birds of Eastern China. I. London, p. 211.

Loche, (1867). Les Oiseaux d'Algérie. Paris p. 256.

Ludlow, F. and N. B. Kinnear (1933). A Contribution of the Ornithology of Chinese Turkestan. *Ibis* 1933, p. 468.

Mayr, E. (1948). Geographic Variation in the Reed-Warbler; *The Emu* 47, pp. 205-210.

Meinertzhagen, R. (1930). Nicoll's Birds of Egypt. London, I. p. 206.

Meinertzhagen, R. (1935). Ornithological Results of a trip to Syria and adjacent Countries in 1933. *Ibis.* 1935, p. 131.

Moltshanov, L. A. (1912). The breeding birds of the delta of the Amu-Darya. *Poljakows Mess. Orn.* 1912, No. 4, p. 269. (russ.)

Niethammer, G. (1943). Die Brutvögel des Peloponnes. *Journ. f. Orn.* 91, p. 210.

Nikolski, A. M. (1883). Reise in die Altaiberge in Sommer 1831. *Trudy d. Petersbg. Naturf. Ges. T.* xiv, Lfg. 1 Petersburg.

Oates, E. W. (1889). Fauna of British India, Vol. I. London; p. 356.

Oates, E. W. (1889). Hume's Nests and Eggs of Indian Birds. Vol. I. London p. 224.

Olphe-Galliard, L. (1891). Faune Ornithologique. Paris 1891.

Osmaston, B. B. (1913). The Birds of Gorakhpur. *J. Bomb. N.H. Soc.* xxii, p. 535.

Pleske, Th. (1889). Wissenschaftliche Resultate der von N.M. Przevalski nach Central-Asien unternommenen Reisen. Zool. Teil, Bd. II, St. Petersburg 1889 p. 125.

Pleske, Th. (1891). Ornithographia Rossica. II. Sylviinae. St. Petersburg 1891 p. 473.

Radde, G. (1884). Ornis Caucasica. Kassel p. 228.

Salomonsen, F. (1929). Bemerkungen über die Gruppe *Acrocephalus arundinaceus* L. *J.f. Orn.* Erg. Bd. II (Festschrift E. Hartert).

Sarudny, N. A. (1896). The birds of the Transcaspian province: *Mat. z. Kenntnis d. Fauna und Flora d. russ. Reiches;* abt. Zool. Lifg. 2. Moscow. (russ.)

Sarudny, N. A. (1916). The Birds of Lake Aral. (In Russian). *Proc. (Iswestija) of the Turkestan Branch of the Imp. Russ. Geogr. Soc.* Vol. xii, 1. Taschkent 1916.

Sick, H. (1937). Morphologisch-funktionelle Untersuchungen über die Fein-Struktur der Vogelfeder. *J. f. Orn.* 85, pp. 206-372.

Skovgaard, P. (1932). Fuglenes Forekomst og Udbredelse som Ynglefugle i Danmark. Danske-Fugle 1932; iv.

Stegmann, B. (1929). Die Vögel Südost-Transbaikaliens. *Ann. Mus. Zool. Ac. Sci. URSS,* Vol. 29, '1928'.

Stegmann, B. (1931). Die Vögel des dauro-mandschurischen Ubergangsgebietes. *J. f. Orn.* 79, p. 196.

Stevens, H. (1914). Notes on the Birds of Upper Assam; *J. Bomb. N.H. Soc.* xxiii, p. 247.

Stolzmann, Y. (1896). Oiseaux de la Ferghana. *Bull. Soc. Imp. Nat.* Moscow, 1896.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Stresemann, E. (1924). Die Gattung *Acrocephalus* im indo-australischen Archipel; *Orn. Mber.* 32, pp. 167-168.

Stresemann, E. (1937). W. Meise und M. Schönwetter. Aves Beickianae. *J.f. Orn.* 85, p. 537.

Stresemann, E. (1940). Die Vögel von Celebes. Teil III, 1; *J.f. Orn.* 88, p. 105.

Stresemann, E. (1943). Überblick über die Vögel Kretas und den Vogelzug in der Aegaeis. *J.f. Orn.* 91, p. 484.

Stresemann, E. (1943). Die Brutvögel des Sees von Lentini, Sizilien. *Orn. Mber.* 51, p. 116.

Sushkin, P. (1914). Zur Vogelfauna des Kaukasus. *Mess. Orn.* 5, p. 38.

Sushkin, P. (1938). Birds of Soviet Altai and adjacent parts of North-Western Mongolia. Vol. II; Moscow-Leningrad 1938 p. 166. (russ.)

Ticehurst, C. B. (1922). The Birds of Mesopotamia. *J. Bomb. N.H. Soc.* xxviii, p. 275.

Ticehurst, C. B. (1922). The Birds of Sind. *Ibis* 1922, p. 548.

Ticehurst, C. B. (1926). Additional Notes on the Avifauna of Iraq. *J. Bomb. N.H. Soc.* xxxi, p. 100.

Ticehurst, C. B. (1926). The Birds of British Baluchistan; *J. Bomb. N.H. Soc.* xxxi, p. 696.

Uchida, S. and Kuroda, N. (1916). Some new Additions to the Avifauna of Yünnan; *Annot. Zoolog. Japon.* Vol. ix, p. 139.

Wickham, P. F. (1929). Notes on the Birds of the Upper Burma Hills. *J. Bom. N.H. Soc.* xxxiii, p. 824.

Withaker, J. J. S. (1905). The Birds of Tunesia. London 1905. Vol. I. p. 114.

Witherby, H. F. (1903). An Ornithological Journey in Fars, South-West Persia. *Ibis.* 1903, p.543.

Witherby H. F. (1910). On a collection of Birds from the South coast of the Caspian Sea and the Elbruz Mountains. *Ibis* 1910, p. 502.

Witherby, H. F. (1938). The Handbook of British Birds. Vol. II. London.

Whymper, S. L. (1908). Nesting of the great Reed-Warbler in India. *J. Bomb. N.H. Soc.* xviii, p. 491.

Whistler, H. (1931). The Indian Great Reed-Warbler (*Acrocephalus stentoreus brunnescens* Jerd.). *J. Bomb. N.H. Soc.* xxxv, p. 450.

Whistler, H. (1938). The Ornithological Survey of Jodhpur State. *J. Bomb. N.H. Soc.* xxxx, p. 220.

Whistler, H. (1944). The Avifaunal Survey of Ceylon conducted jointly by the British and Colombo Museums. *Spolia Zeylanica,* Vol. 23, part. 3 + 4, p. 171.

Whistler, H. (1945). Materials for the Ornithology of Afghanistan; Part III. *J. Bomb. N.H. Soc.* xxxxv, p. 106.

Whitehead, C. H. T. (1909). On the Birds of Kohat and Kurram. *Ibis* 1909, p. 119.

Yen, K. Y. (1930). Birds from Yao-shan, Kwangsi. *Bull. of Dep. of Biol.* Kanton 1930, p. 17.

Yen, K. Y. (1934). Eine Vogelsammlung aus Kwei-chow. (China); *J.f. Orn.* 82, p. 389.

Zimmer, K. (1943). Der Flug des Nektarvogels (*Cinnyris*). *J.f. Orn.* 91, pp. 371-387.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY FISHERMEN'S INGENUITY.

AGE-OLD METHODS OF CAPTURE NOT YET OUTDATED

BY

S. B. SETNA, M.SC., PH. D. (Cantab), F.N.I.

Director of Fisheries, Bombay.

(*With 1 plate and 5 text figures*)

A charge generally levelled against fishing in our country is the primitiveness of the methods employed in its pursuit. The main target of criticism is the comparative inefficiency of the nets used, as well as the manner in which they are employed. The charge is, to a great extent, baseless as will be readily apparent from even a superficial study of the nets used along our coast. The nets have been evolved after a long process of trial and error, so as to secure the maximum catch for the outlay of the considerable amount of labour employed.

ADEPTS IN CRAFT

Fishermen are generally supposed to be ignorant. Their ignorance is relative, inasmuch as it may pertain to a lack of knowledge of the work-a-day world. Their complete proficiency in matters affecting their own industry is unquestioned. Their knowledge in this respect is truly amazing. It might not be grounded on scientific principles, but it is extremely efficient and discloses an intimate acquaintance with the fundamental concepts of biology, physics, state of the weather and movements of the tides. Their knowledge of these highly technical subjects is empirical, but it is, nevertheless, sound, as all the various methods of fishing practised on our coast—pelagic and deep-sea—incorporate awareness of one or the other of the fundamental principles which form the bases of these highly developed fields of study.

The results achieved by our fishermen are truly remarkable, notwithstanding the numerous handicaps under which they labour. They would certainly show results worthy of comparison with those achieved in the West or in Japan only if their economic resources permitted the use of engined craft. They have shown endless ingenuity in their ability to devise various types of nets for the capture of fish of different sizes and inhabiting varying layers of the sea. The fishermen, it is commonly said, are conservative, but their conservativeness springs from their penury. There is not the least doubt that if power-propelled vessels were placed within their reach, they would be able to adapt their existing types of nets to the capture of the various fish that occur in divergent layers of the seas washing our coasts.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Lessons of Recent Years

The success that has attended the use of launches for the transport of fish in Bombay has furnished conclusive proof that our fishermen are not averse to the adoption of new ideas provided that the reforms are both beneficial and within their reach. The formation of fishermen's co-operative societies for the acquisition of launches to transport fish shows that they are capable of following progressive principles. The imagination of our fishermen has been caught not only by the advantages of power craft for the transport of fish but they have also been greatly impressed by the satisfactory results that have accompanied the experiments to use power craft for the capture of fish. There is a vast and promising future before the industry, but all depends on our approach to the various problems.

Importation of trawlers, purse seiners and Danish seines is excellent as far as it goes, but they will need, apart from expert technical skill, vast outlay of capital, which our fishermen can ill afford in their present impoverished state. They will go in, in the fullness of time, for these super-vessels of the industry. The paramount problem today is mechanization of the existing sailing craft. The pace of their conversion into power-propelled vessels should be greatly accelerated if the industry must progress and yield the fruitful results of which it already holds enormous promise.

Line of Advance

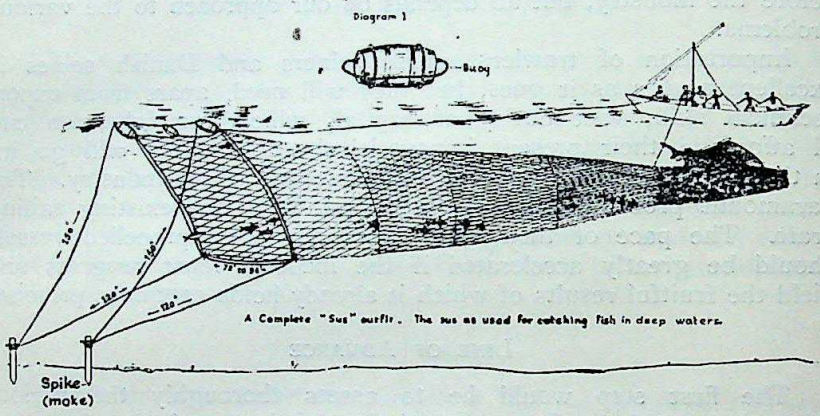
The first step would be to assess thoroughly the various advantages and disadvantages of the existing methods of capture and discover whether improvements are not possible in the different types of fishing—drift-net, long line, bag net (dol) etc.—now extensively used along one stretch or another of our extensive coastline. Thus, the principle underlying the use of drift-net, whether in Britain or in India, is the same. There are, however, differences in the length and depth of the net. The use of larger drift-nets is possible only on larger vessels if they are equipped with power and other mechanical devices for the rapid paving and hauling of the net. If our vessels using the drift-net were run on power, they would, most certainly, be able to extend the range of their operation. At present, they cannot venture very far out to sea and have to skirt, as it were, the coastline, so that they can make for shore as quickly as possible at the least sign of bad weather or to prevent deterioration of their catch.

Drift-netting:—Though the drift-net is one of the most effective contrivances for the capture of fish, it is nevertheless, subject to certain limitations. Tropical seas, as is wellknown, abound with sharks, They are an ever-present menace to our fishermen, who fear them not so much for themselves as for the extensive depredations they make on their catch. The fish gilled in the drift-net present sharks with a tempting and immovable target on which they eagerly pounce. The fishermen are sorely stricken when the sharks, in getting at their quarry tear vast rents and sometimes, even swallow big segments of their

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nets. For some time then the fishermen are jobless at their craft, until they have repaired their net. Thus, the everlurking menace of sharks is a factor compelling restriction on the size of the net. It must, therefore, be handy in size,—the netting being 2000 fathoms in length and 2 fathoms in depth—so that not only can it be quickly manipulated but also the netted fish can be pulled aboard in anticipation of the attacks from sharks. In fact, fishermen at the fishing fields almost throughout the night row up and down the length of the net pulling it up and stowing away the netted fish and again dropping it in order to avoid presenting sitting targets for sharks and thus to save their nets from the vicious destruction caused by them.



A Complete "Sus" outfit. The sus as used for catching fish in deep waters.

Fishermen in the temperate zones are, on the other hand, spared such perils, for the simple reason that sharks are not usually denizens of their waters. Nets are shot at dusk and hauling begins shortly before dawn. The net is paved at right angles to the incoming or outgoing current, so that it hangs in the water about a fathom below the surface, and is kept in position by floats. A British drifter will shoot anything up to 100 nets, each net being about 60 yards long by 10 yards deep. Thus a wall of netting about two miles in length is laid by the drifter. The fish moving with the tide get enmeshed. The un-anchored vessel, to which the net is attached at one end, drifts a while, may be for five or six miles in the night, according to the current. At dawn the fishermen merely gather up the net and hie with it to port.

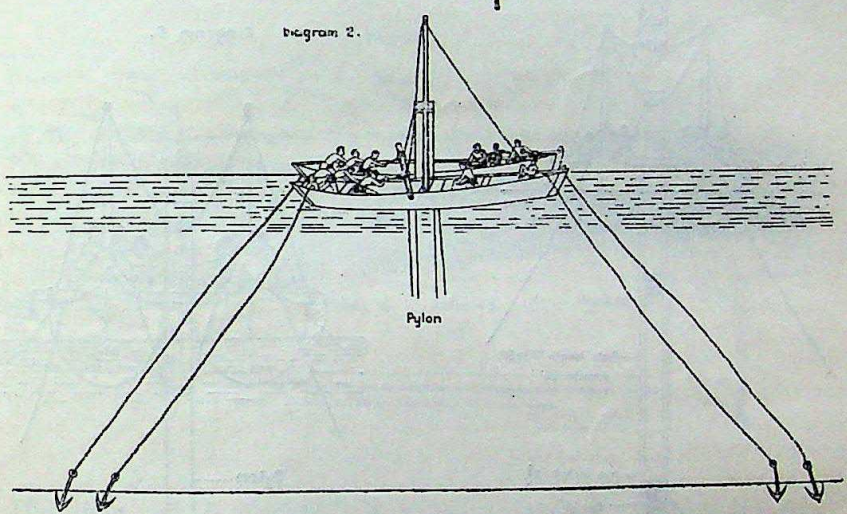
The implied line of reform is obvious, so far as fishing with drift nets in our waters is concerned. The menace of sharks may be, to a great extent, overcome if not entirely eliminated, if our fishermen were to employ, instead of sail boats as now, powered craft to gain the fishing grounds and pave out the net. The great waste of human effort now involved by reason of constant trips up and down the length of the net by a dinghy, may be obviated if a powdered skiff were used as an adjunct to the parent vessel instead of the row boat as at present. This

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

could cruise up and down the length of the net throughout the night in order to collect the gilled fish, as well as to stave off the depredations of sharks.

Line fishing:—Line fishing is another method of capture which holds promise of fruitful results. Already our fishermen practise line fishing extensively all along the coast for particular varieties of fish, but their efforts are not attended by striking success. Their unsatisfactory catches are due to limitations inherent in the type of vessel used. Their sailing boats do not enable them to go far out to sea, as the paramount consideration is quick return to shore. Moreover, the smallness of their craft precludes the use of a large enough number of hooks. These obvious handicaps would be greatly minimised, if not surmounted, with the use of power-propelled vessels, the greatest advantage of which would be that they would be able to fish anywhere and make



straightway, within a comparatively brief period, for the large consuming centres. This sailing boats are unable to do. They have first to get to their bases and then await expeditious transport, either by trucks or power vessels to convey their hauls. The vast potentialities for line fishing are borne out by the discovery about 100 miles off Ratnagiri of a great field of red snappers (perches) which can be taken on line and hooks. Preliminary surveys reveal that this particular field—Angria bank lying in latitude 16° 30′ N. and longitude 72° E.—is an extensive one and is capable of yielding fruitful results for the appropriate outlay. It is also the considered opinion of those who discovered the field that there must be equally rich fishing banks elsewhere along our coast, though there is no knowledge of them, because they have never been approached. Such fishing banks are utterly beyond the reach of our sailing boats. Even power-propelled vessels are reluctant to approach them individually on account of the legitimate fear of the unknown at so great a distance off-shore.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

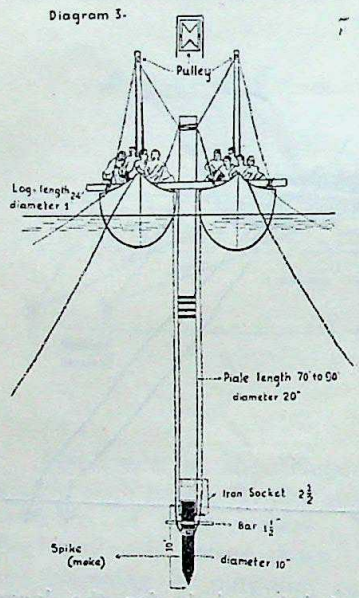
Digitized by Arya Samaj Foundation Chennai and eGangotri

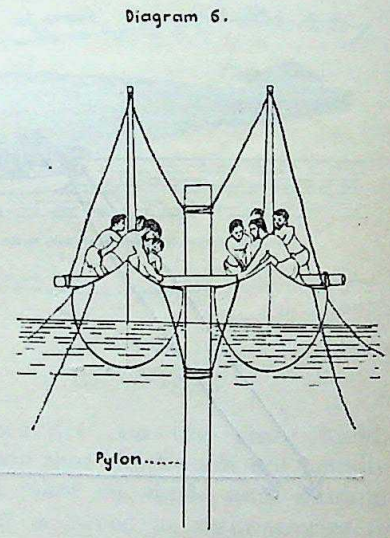
Successful working of such banks at so great a distance can be undertaken by our present power-propelled vessels only if they work in teams, or if they have the confidence that if any one of them sallies forth individually to the bank there is the assurance that other vessels will also be expected to operate in the same region.

The use of power vessels to capture sharks has been amply demonstrated in our waters, and our efforts show that there is a great future for this particular industry.

Japan's Example

Japan's example shows that mechanization of the fishing fleet can be rapidly achieved provided there is not only the proper spirit of enterprise but a determination and willingness to disregard age-





old methods in favour of those that will yield better results. What our fishermen need is that a lead must be given to them. Pilot experiments with existing nets used, not from sailing boats as at present, but from power vessels, must be undertaken on an intensive scale at the more important fishing centres along India's coastline. The length of nets that may be used from power-propelled vessels is large, and there is not the least doubt that our fishermen will be resourceful enough to exhibit their traditional ingenuity in the skilful adaptation of their present devices to the altered environment of engined craft.

One example alone will suffice to illustrate not only the originality but also the power of adaptation of our fishermen to suit the peculiar conditions of their industry. Perhaps, this remarkable gift and instinctive genius of our fishermen may well be proved by a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

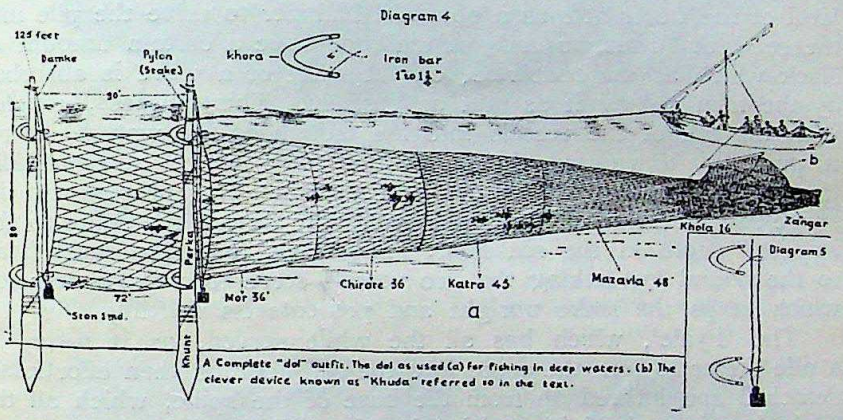
Digitized by Arya Samaj Foundation Chennai and eGangotri

description of the 'dole' net, which is extensively used by them 20 miles off the shore, with the coastline completely invisible.

Description of net:—The 'dole' is conical in shape, the base, which is the open end, being rectangular. The length of the net from the rim of the base to the tapering closed end is about 150 feet, with a circumference at the mouth varying from 180 to 265 feet. Although the net resembles a huge trawl, it, nevertheless, differs from it in being stationary, and, unlike the trawl, it captures surface fish at a depth of a few fathoms.

Tidal energy exploited:—The net is worked entirely by the force of the tide. It is set in the water so as to face the incoming current. As the tide starts to recede, the position of the net is reversed, the open end facing the opposite direction. The object in both positions is propulsion of fish into the net by the force of the current.

Diagram 4



A Complete "dol" outfit. The dol as used (a) for fishing in deep waters. (b) The clever device known as "Khuda" referred to in the text.

The dole net is capable of being employed in two different fashions. The first method (Sus fishery) is employed from Kathiawar in the north to Revdanda in the south. The second method (Khunt fishery) is employed from Revdanda (the port for Alibag) to Versova.

The main characteristic of both the methods is the technique used to anchor the net and to keep its mouth open. The mouth of the net is kept in position by means of ropes from each of its four extremities, fastened securely to two enormous wooden spikes 'moke' embedded in the muddy floor of the sea. The upper lip of the net is prevented from sagging by means of three floats, two of which are at the extremity of the lip, and one is in the centre. The lower lip of the net hangs freely, the pressure of the rushing current and the two bottom ropes keeping the mouth wide open. The position of the net when it is fully set is illustrated in diagram I.

Pile driving at sea:—The spike itself is driven into the floor of the sea by an ingenious method. The spike is, in reality, detachable part of a lengthy stake, the lower end of which has an iron socket into which the upper end of the spike fits firmly. The ever present risk of irretrievable loss of the spikes when the stake

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

is being lowered is prevented by two ropes tied to the spike below the iron rod inserted laterally across each spike.

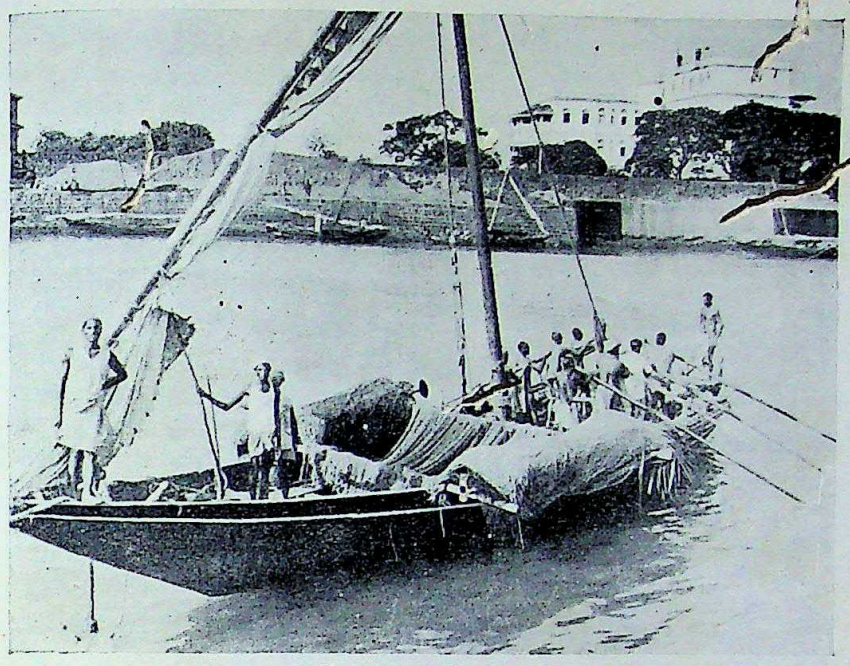
The operation (diagram 2) involves at low tide the use of two boats, which on their arrival at the fishing field cast four anchors, two ahead and two astern. The two boats are then linked to each other by means of a log across, which is made fast by means of ropes tied to the broadest cross beam in each vessel. The most important phase of the entire operation now begins. The upper end of the spike is inserted into the iron socket of the 'Pyale' or stake (diagram 3), which is levered to the centre of the log. The upper end of the 'Pyale' is connected by a rope to a pulley arrangement at the mast head of the two vessels. The 'Pyale' is raised till it is upright when it is lowered into the sea. A stout rope is looped round the upper part of the 'Pyale', and each end of the rope drawn under the log is taken into either vessel. The boats are manned by a crew of seven in each. The rise and fall in the level of the water acts as a powerful hammer to drive the pile into the sea-bed. The two ends of the rope have a certain amount of slack which as the boat rides on the crest of a wave is absorbed by the men pulling it as taut as possible. This tautness, coupled with the fall of the vessels into the trough of the waters, exerts a powerful downward thrust on the spike which automatically drives the spike down deeper and deeper. The process of the surge and recession of the waves eventually thrusts the spike to the required depth in the sea floor. The ropes from the mast head to the lateral log linking the two vessels serve to maintain tension which keeps the stake upright and prevents its drifting.

The 'Pyale', which has all the while served, as it were, as a pile driver to ram the spike into the sea floor, is then effortlessly detached and levered up from the base of the spike, which all the while had been held in position by the pull exerted on the ropes tied to the spikes below the iron rod inserted laterally across the spike, as already referred to above. The loose ends of both ropes are fastened to a float. The float serves roughly as an indication enabling the fishermen to determine the distance at which the second spike must be driven in. Anchors are cast, in order to render the boats immovable at their station, and once more the whole process of driving the spike is repeated at this new location. The distance between the two spikes is 150 feet. The top ends of the ropes, two from each spike, are tied to the four extremities of the mouth of the net, so that it remains open. The loose ends of the ropes from each spike are secured to buoys after the net has been hauled aboard for repairs or for dyeing. The buoys serve as indicators to the location of the spikes, so that no time is lost when the fishermen desire to set the net.

Pylons in the sea:—The net is also set by another method, which differs but slightly from the one just described. The second method is known as 'khunt' fishery (diagram 4). The difference between the two methods lies in the manner of fixation of the net. Whereas buoys and ropes are employed, in the first instance to keep the mouth open, stout pylons (palisades or upright posts), each about 125 feet in length are used for setting the net in the second method.

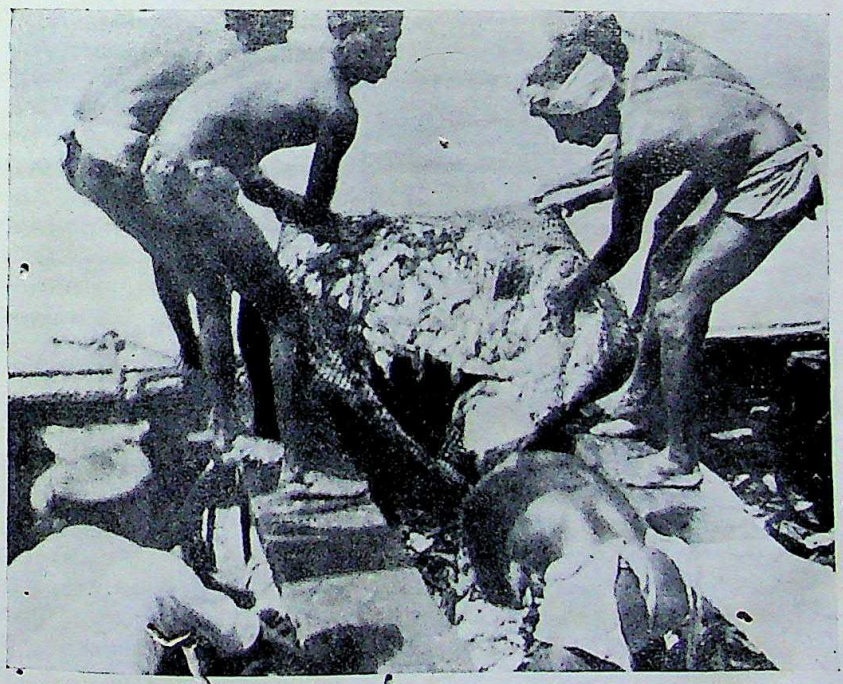
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



DRIFT NET FISHING

Many types of sailing craft, all of them primitive, are used along our coast to catch fish. The vessel in the picture is used for fishing in deep waters. Though primitive, the boat uses a drift-net, one of the most modern fishing nets for the capture of surface fish. The department is now endeavouring to induce fishermen to use these very nets in conjunction with power vessels.



The bag end of a 'dole' net crammed with Bombay Duck is seen here being hauled aboard a row-boat at the fishing fields, about 20 miles off the shore of one of Bombay's suburbs.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Each pylon consists of usually three, sometimes four, enormous trunks of trees, khunt 60 feet, parka 45 feet, damke 35 feet, bound one to another by ligatures. The pylon is driven about 24 feet into the sea floor while it projects about 10 feet above the surface of the water at the highest tide. Each pylon costs Rs. 1,000.

The method of fixation of the pylon is almost identical to that of the insertion of the spike into the sea in the first method. The 'Pyale' of the first method is replaced by the pylons or upright posts, which are towed to the fishing fields by a boat apiece. Each pylon is driven separately. The same principle of pressure exerted by the rise and fall of the waves is observed in order to pound the pylon into position (diagram 2).

To each of the pylons is fixed a peculiar contraption known as the 'khora', a part of which is of wood and the other of iron. The wooden part is a U-shaped contrivance, resembling very much the wooden part of a bow when fully drawn. The intervening space between the two tips is 4 to 6 feet. Round one tip is wound an iron rod, which is looped, the loose end being wound round the other extremity. Two of these contraptions are slung over each pylon, a rope of the depth of the mouth linking the two iron bars at their junctions. Through the loops themselves is passed another length of rope to the lower end of which is suspended a weight or a large stone weighing about a maund (diagram 5). The upper end of the rope is wound round the part of the pylon projecting above the surface of the water. Likewise, two other U-shaped contraptions of wood with iron loops are passed over the other pylon, together with a rope weighted at one end being passed through the loops. The pylon and the U-shaped wooden pieces form as it were the foundation on which the net is laid when it is to be in operation. Each end of the lower lip of the net is fastened to each of the bottom loops, likewise each end of the upper lip is attached to each of the top loops. The net is now ready to be slid down into position. The mouth of the net can be raised and lowered along the pylons according to the movements of fish. The mouth itself is also capable of contraction by a reduction in the length of the ropes linking each set of loops. The object of contraction of the mouth is to narrow the area of resistance when the stress of the tide is excessive. Generations of experience have made the fishermen such adepts that they are able to sense almost instinctively the precise occasion when the mouth of the net must be contracted. The precaution is essential in view of the costliness of the net and the immense labour involved in the manufacture of one. If such a net is seriously damaged the fishermen are likely to be out of the fishing fields for a considerable time, with consequent great loss in their earnings.

Upward leverage:—The method of extraction of the pylons at the end of the fishing season is no less ingenious than the technique followed in their fixation in the sea. The boats come to their stations equipped in the same manner with pulleys and logs as they did at the start of the season. The boats are arranged as in diagram 6 and recourse is had once more to the power or force generated by the rise and fall of the waves. The energy of the restless

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

motion of the waters is now used to lever out, instead of levering into, the stakes from their sockets in the sea bed. With the arrival of the boats at their station, a loop is thrown round the pylon, each loose end being gathered into each boat respectively. The loop is lowered to a certain depth when it is made tort by upward pulls on the loose ends. The tautness is increased every time the boats sink in the trough of the waves, the resultant tension acting as a sort of jack to prise the pylon out from the sea floor where it lies embedded. This process, which usually lasts about 3 hours continues until the entire pylon is pulled clear out of the sea bed. Likewise, the spikes are extracted from the sea bed. Their position is known because of the buoys to which they are fastened by ropes.

Construction of net:—No less ingenious than the method of fixation of the net (dole) is the construction of the net itself. The net measures 150 feet in length when it is fully extended. The size of the mesh diminishes as the net tapers to its extremity so that towards the rear it is almost a completely impenetrable bag. The net consists of a number of segments, each bearing its distinctive name, and each formed from twine of varying ply.

A feature of the net is its bag end which can be hauled up and the trapped fish can be stowed away on deck, while the main mouth is wide agape. The fish are channelled into the tapering end, the opening there being closed with a rope knotted round it. The rope is long enough to enable the log to rest on the sea floor. The fishermen are present on the ground during the fishing operations and usually take a location in proximity to the bag end. To protect the boat being swept away from its locale a rope is tied from the bow of the boat to one of the fixed side buoys.

Both the aforesaid methods have been practised for generations. They reveal, as already stated, not only extraordinary ingenuity but also a thorough knowledge of the movements of the fishes when they approach our shores. The technique employed in both methods is particularly noteworthy. The most remarkable feature of the entire operation is not only the great economy of man-power employed but the fishermen's realisation and application of the principle of gravity, to pile into the floor of the sea a stake without the use of such modern appliances as winches and cranes. The untutored fishermen, ignorant of all knowledge of theories of physics, have been practising this effective method for unnumbered generations.

The empirical method, based on no other knowledge than that derived from experience, has been accompanied by such striking success that it has emboldened the fishermen to increase steadily the radius of operation from the shore. They have ventured so far afield into the sea that the fixed pylons are a real obstacle in the fairway through which ships regularly ply. In fact, the menace of these obstructions has assumed such proportions as to have compelled the authorities to draw up charts indicating the precise positions in the sea where the pylons may be fixed.

The net is not selective but multi-purpose inasmuch as it does not discriminate among the fish which it is intended to trap. The

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

haul of such nets includes fish so diverse as:—*Harpodon nehereus* (bombil); *Stromateus cinereus* (serga); *Trichiurus savala* (wakati); *Trichiurus haumela* (wagti); *Sciaena sina* and *Sciaena diacanthus* (ghol); *Coilia dussumieri* (mandeli); *Sciaenoides pama* (kala droma); *Minous monodactylus* (dhoma); *Chirocentrus dorab* (karli, dantal); *Culpea fimbriata* (pedwa); *Ambassis sp.* (kepta); shrimps, prawns, crabs, sharks, skates and rays.

Superimposed net:—Even more ingenious than the net itself and the manner of its laying is the clever device (known in Marathi as the khuda) to foil onslaughts by sharks and other predatory fish on the ready target afforded by the silvery sheen of the fish secured in the bag ends. The device, which looks very much like an open skylight (diagrams 1 and 4), consists of a subsidiary oval bag net tied to the bag end. Predatory fish get entangled there. A light pole at the upper edge of the subsidiary net ensures that it remains open.

The catches made by the 'dole' represent, perhaps, the preponderant value of the total haul of all other types of nets put together. Monetarily, the total quantity of fish caught by this method is estimated at over a crore of rupees.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON THE SNAKES AND MAMMALS OF THE HIGH WAVY MOUNTAINS, MADURA DISTRICT, S. INDIA

BY

ANGUS F. HUTTON

PART I—SNAKES

(With a text-figure)

The High Wavy Mountains are situated in the S. W. corner of Madura District on the Travancore frontier. They consist of an undulating plateau, approximately 17 sq. miles in area, with an average elevation of 5,100 ft. though the highest point (Brooks Peak) is over 6,400 ft. high.

The plateau is covered with dense evergreen forest, with the exception of a grass covered ridge overlooking the plains. There are quite a number of rocky patches in the jungle which are covered with grass, and the borders consist of hill-bamboo (*Ochlandra travancorica*) or *Eeta* as it is known locally. It is also found along the river banks and on the windswept ridges. A small area is under tea, cinchona and cardamon cultivation. The slopes of the mountain rise very steeply from the plains and can be divided into two belts; the first (1,200′–3,000′) consists of light deciduous forest with a dense growth of elephant grass and the whole area contains huge scattered rocks and boulders. The second belt is of bare rocky grassland, devoid of trees, but with considerable patches of *Strobilanthes kunthianus*. This belt continues up to 4,000′ where the evergreen forest begins.

With the exception of the B.N.H. Society's expedition in 1917, (described in the *Journal*, Vol. 25, No. 2; Vol. 27, No. 3; and Vol. 35, No. 3) these hills were entirely unexplored and uninhabited until 1929, and even since then only a small area was really known. In view of this it is not surprising that there should be some interesting records.

These notes are written with reference to 'The Fauna of British India', Vol. 3 (Reptiles and Amphibians), by Dr. Malcolm A. Smith, and I have followed the order used by him.

Family: UROPELTIDAE

Melanophidium punctatum. (Tamil: Manalli Pambu.)

One specimen taken in the evergreen forest. Apparently not common. In life it is a beautiful snake. At the time of writing, I have one in captivity, which spends most of the day curled up asleep in its drinking water, and only comes out at night.

Melanophidium sp.? Three specimens were found altogether. The first was very badly damaged, dried and quite useless for identification purposes, and was discarded. The second was a perfect specimen and was sent to Bombay for identification but unfortunately it got lost in the post. Luckily I kept a rough

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

description with me and this agreed exactly with my third specimen—a skin which was sent to me, and which I have sent on to Dr. Malcolm Smith. The description below is fairly accurate, and will suffice until further specimens can be found.

Snout obtuse; rostral small; internasals slightly larger than adjacent scales; parietal shields twice as long as broad; frontal shield touching the top of the eye. The eye within the ocular shield. No supraocular or temporal shield. A mental groove. Tail slightly compressed; terminal scute with two superior ridges ending in two small points.

Scales in 15 rows, the 3 dorsal rows faintly keeled. Laterals smooth. Ventrals 131 four times as broad as adjacent scales. Caudals 26, divided and decreasing in size towards the end of the tail. Anal shield divided.

Colour: iridescent brown above and below, with a black or dark stripe down the back covering the three rows of keeled scales.

Length: head and body 225 mm.; tail 37 mm.

Plectrurus perroteti.

One specimen taken in the evergreen forest. Not very common. Total length 370 mm.

Uropeltis ellioti. 5 specimens were collected in the evergreen forest, where it is fairly common. It seems to prefer damp localities, such as swamps and river banks. One female in captivity produced 4 young. The markings on the belly of the newly-born young are white and only change to yellow after a week or more. I have noticed this in *U. pulneyensis* also. Total length, average 210 mm. Young are 55 to 72 mm.

Uropeltis wood-masoni. Three specimens were taken in the evergreen forest; two were normal in colour and the other was much darker with the belly entirely black. Total length: average 231 mm.

Uropeltis arcticeps. One specimen taken on the plains at the foot of the hills at 1,200′ altitude. In scale counts it resembles *madurensis*. V 148 & C. 6, otherwise the description agrees with *arcticeps*. Total length 300 mm.

Uropeltis pulneyensis. This is the commonest snake in these hills: 53 specimens were examined, and I have had ample opportunity for studying its habits. The majority of my specimens were released after examination as they do useful work in the garden controlling pests such as cutworms, and certain insects, which from a few dissected specimens seem to be their main diet apart from worms. The majority of my specimens were caught on the roads, and in the tea nurseries during the early part of the S. W. Monsoon. Young ones are frequently seen at this time also. It may be due to their burrows being flooded out that forces them above ground. Decayed fallen trees, stumps and heaps of stones are favourite homes for them during the rains, and I have often, found two or three sharing a hollow, and sometimes young ones, too. They were usually in a very lethargic condition which leads me to believe that they hibernate at this time of the year. With regard to their breeding habits I once found a pair in copula during May. I kept them in captivity and at the end of July the female produced 8 young. The markings on the belly were white and took 7 to 10 days to turn yellow. They averaged 60 mm. in total length at birth. The young have voracious appetites, and some of mine swallowed worms almost as big as themselves. One exceptionally large female measuring 450 mm. in length and 18 mm. in diameter produced 17 young in captivity. This seems to be most unusual both as regards size and numbers. (Smith, Fauna Brit. Ind., p. 64, '3 to 8 young at a time' and p. 85 'total length 380 mm. and diameter 12 mm.'). The average length of all my specimens was 237 mm.

Rhinophis sanguineus.

Three specimens were taken from the deciduous belt where it is fairly common. One juvenile measuring 150 mm. was also taken; the red on the underpart of its tail was not so bright as in the adult specimens.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Rhinophis travancoricus.

One specimen collected in the foothills at about 1500 ft. Does not appear to be common. Total length 150 mm.

Family: BOIDAE

Python molurus. (Tamil: Mallay Pambu.)

No specimens were taken but it seems to be fairly common up to about 5,500 ft. Some years ago, I am told, it often used to be seen in young tea clearings, in the evergreen forest. Prater, in a letter to me records meeting one in these hills in May 1917. Two local skins were examined and measured, one of 12 ft. and the other of 17 ft. in length, though the latter had been stretched in the curing. In the deciduous belt I once saw one on a rock, but it escaped before I could capture it.

Family: COLUBRINAE

Elaphe helena. (Tamil: Kattu Pambu.)

A common snake in the deciduous and rocky grassland belts. Seven specimens were taken. The largest was 1200 mm. in length and very dark in colour and had very few of the rings round it visible. Average length 670 mm.

Ptyas mucosus. (Tamil: Sara Pambu.)

Very common in all the belts. Those from the evergreen forest are considerably darker than the others. Fourteen specimens were taken, the largest 2475 mm. in length. The fat surrounding the intestines is used by the local people as a remedy for skin complaints; they apply the melted fat onto the affected parts. I am informed that unless the fat is removed immediately the snake is killed it loses its medicinal (?) properties and is useless!

Coluber fasciolatus.

Three specimens were taken in the deciduous forest belt, where they are fairly common. It is an aggressive snake and will make no attempt to escape, but it will stand its ground and bite readily with loud explosive hisses and this plus its habit of inflating its neck makes it closely resemble a cobra. In spite of its viciousness it is surprising how soon it becomes tame in captivity. One female I had laid 7 eggs and shed its skin at the same time during March.

Oligodon venustus.

Fairly common; five specimens were obtained in the evergreen forest and rocky grassland belt. Average length 362 mm.

Oligodon travancoricus.

Also fairly common in the evergreen forest, which it rarely leaves. It is more shy in its habits than the other snakes of this genus. Five specimens were taken, including two juveniles (in April); the latter measured 100 mm. and 120 mm. in length. Their bellies were white with black spots compared to the yellow of the adults. The adults averaged 387 mm. in length.

Oligodon taeniolatus.

A very common species preferring the higher elevations of the evergreen forest. It is very fond of basking in the sun on rocks or on grass. My dog caught two or three on the lawn when they were thus engaged. I captured a few in my garden where they lived in stone revetments. One female I tried to catch in April, retreated into a hole in the revetment just out of reach, and so I removed some stones to get at her, and disclosed a cavity, in which were 9 ova and the snake. On being picked up she bravely defended herself and her eggs, and inflicted several bites on my fingers. The sensation was one as if cut by a razor blade. In all eighteen specimens were taken, including a young one in May which measured 75 mm. The average length of the adults was 390 mm.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Oligodon brevicauda.

One specimen only was taken in the evergreen forest; the belly of it was more orange than red in colour, I think it must have recently shed its skin, as it had a beautiful sheen all over it. This probably explains the orange colour. It measured 393 mm. in length.

Lycodon travancoricus. (Tamil: Kattu Vyrian Pambu.)

Common in the evergeen forest near human habitations which it often enters. Four of my five specimens were caught in my bungalow at night. They seem to like a diet of cockroaches. Both the specimens I dissected contained their remains, also those of other insects. They do, therefore, a certain amount of good. Their average length was 420 mm.

Lycodon striatus.

Uncommon, only one specimen 185 mm. in length was taken in the deciduous belt at about 3,000′.

Dryocalamus nympha. (Tamil: Kattu Vyrian Pambu.)

Three specimens were caught in my bungalow at night. Fairly common. Their diet and habits are similar to the last genus. Average length 211 mm.

Natrix piscator melanzostus. (Tamil: Tanni Pambu.)

Two specimens were taken with a butterfly net whilst crossing a river. Two others which evaded capture were seen in a large waterhole where they were busy catching tadpoles. They were a joy to watch, they seemed so completely in their element in the water, they dived beneath the surface and would swim twenty yards or more before coming to the surface for breath. Under water they seem able to swim faster than they can on the surface. One specimen I dissected contained four tadpoles and two small fish 2″ in length. They seem fairly common in the evergreen forest. Average length 580 mm.

Natrix stolata.

Two specimens were taken in the deciduous belt where it is not uncommon near streams. One of my specimens was found when half-eaten by a cobra which I killed. The skin of this specimen, when stretched, disclosed a beautiful brick-red colour beneath the scales. Average length 607 mm.

Macropisthodon plumbicolor. (Tamil: Pacha Pambu.)

Fairly common in the deciduous belt near water. I never saw one above 4,000 ft. Four specimens were taken including a young one 100 mm. in length (in May). Average length 520 mm.

Atretium schistosum.

One specimen was taken in the deciduous belt. It does not appear to be common. My specimen did not exhibit the red stripe down the body in scale rows 5 and 6, which according to Wall (Fauna Brit. Ind., p. 320), specimens from S. India should have. Perhaps it was due to its size as it only measured 300 mm. in length.

Boiga ceylonensis. (Tamil: Komberi Mooken Pambu.)

This beautiful snake is very common in the evergreen forest and in the deciduous belt. Fifteen specimens were taken. The females in every case were smaller than the males, and were more orange than yellow in ground colour, especially about the neck. This colour of course disappears after the specimen is placed in spirit. Many of my specimens were found whilst sleeping in the pandals of tea nurseries. One was found in the bungalow at night on the picture rail; how it got there I cannot imagine. Picking this snake up by the tail to avoid being bitten (for it is very aggressive and bites readily) is quite useless, as it rapidly climbs up its own body and inflicts a painful bite on the hand that holds it. I found this out with one of my first specimens, a female, I had extracted from a hole in a tree, by its tail. After being bitten, I grabbed its

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

neck with the other hand whereupon it promptly laid 7 eggs in my hand! This incident occurred in April. If pursued in a brush or pandal it can travel amazingly quickly, and can jump out a good distance onto the ground. They are excellent climbers; I once saw the shed skin of one wedged into the bark of a tree over 15 feet up, its owner was a little lower down on a branch. Their main diet consists of frogs, tree lizards, and other snakes and insects of various kinds. They are also partial to small birds; one specimen I dissected contained the feathers of some bird it had eaten. Sometimes if handled by the neck it can eject a stream of evil-smelling fluid from the anus yellow and white in colour, which is most unpleasant, and the smell is difficult to get rid of. I have noticed this habit in some of the Uropeltidae also. Their average lengths were: males 970 mm and females 760 mm.

Dryophis dispar. (Tamil: Pachelli Pambu.)

Very common in the evergreen forest and in the deciduous belt. Thirteen specimens were taken. One found in March in a hollow log had just deposited 11 ova, which seems most unusual as this species is known to be viviparous. I can only put it down to a case of premature birth as the young were fully formed in the ova and were able to make good their escape when I cut the ova open. They measured 70 to 90 mm. The average length of the adults was 785 mm.

Dryophis perroteti.

Two specimens were taken in the deciduous belt. It does not appear to be common. One of my specimens was more olive-brown in colour than the usual green. One young one was also taken (in May) which measured 340 mm. The adults averaged 650 mm.

Dryophis pulverulentus. Uncommon. Only one specimen taken in the deciduous belt. The brown stripes on the sides of the head were very indistinct. Length 672 mm.

Callophis nigrescens.

One specimen was taken in the deciduous belt whilst shedding its skin on a rock. The new skin was bright scarlet though the unshed part was quite dull. It seems to be rare in this area as none of the local people had ever seen one before.

Naja naja naja. (Tamil: Nalla Pambu.)

Seven specimens were taken in the deciduous belt where it is fairly common up to 2,500 ft. One male specimen measuring 7′6″ in length (2,250 mm.) was one of the so-called Black Cobras which are rather rare in the South. The spectacle markings were hardly visible; the lower part of the hood being jet-black. The lower jaw and underneath the hood was yellowish, and changed into one narrow and two broad black bars with brown in between, about 9″ from the head. The tail was jet black above and lighter below. On being examined, the fangs were found to be missing and the surrounding areas rather sore. There were two reserve fangs on each side, but these had not come into use. It must have lost them in attempting to kill some animal, which escaped, though no doubt died later on. This specimen is probably exceptional as regards size. Wall records one 7′ in length from Ceylon. One female specimen was killed whilst devouring a Green Keelback. Their average was 1,400 mm.

Naja hanna. (Tamil: Raj Naga Pambu.)

Not very common. Some years ago one was shot in the deciduous forest at 2,000 ft. and measured 16′ in length. This is the only record I have of one being seen in this area.

Family: VIPERIDAE

Vipera russelli. (Tamil: Kanna Vyrian Pambu.)

Two small specimens were taken in the lower part of the deciduous belt. Both were much lighter in colour than usual. They averaged 640 mm. in length. They are uncommon in this area.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Trimeresurus macrolepis. (Tamil: Chatti Thaela Pambu.)

This species is very common though confined entirely to the evergreen forest. It is often found in the loose leaves at the base of clumps of *Eeta*. After having seen three broods of young ranging from 4 to 7 in number, among the leaves at the base of these clumps (in October) I have come to the conclusion that they are born there, and only venture out after they have attained a size of 8″ or more. On danger approaching, the young hurry back to the protection of the leaves and completely bury themselves in them. I never found an adult accompanying these broods. Colour variations in this species are considerable, and range from dark-green (almost black) in the wet weather to light yellowish-green in the dry weather. Ferguson (Fauna Brit. Ind., p. 513) has noted similar seasonal colour changes in *T. malabaricus*. A number of the specimens caught had two fangs on either side in use and both were capable of injecting venom. One dissected specimen had 6 and 7 reserve fangs, in addition to 2 on each side already in use. They ranged from 3 to 15 mm. in length. Several specimens had damaged vertebrae. They are often met with in the monsoon lying on top of tea bushes, where they are almost invisible. We had three cases of pluckers being bitten on the hands. None of them were fatal though intense swelling took place and the patients' temperature went up to over 100°. The swelling usually subsided after 2 to 4 days, and finally after a week or so patches of skin surrounding the wound would slough. I was told that some years ago a two-month old baby was bitten on the neck by one and in spite of medical attention it died within 24 hours. This snake must do a lot of good in controlling rats, as many of the specimens caught had rats in their stomachs. One had swallowed three full-sized ones, and was extremely sluggish and made no attempt to defend itself on being picked up. The largest specimen taken measured 1,000 mm. but the average size was 570 mm. Out of 37 specimens caught, 15 had the two small scales, between the supraocular and frontal shields (fig. 1). Smith (Fauna Brit. Ind., p. 505) mentions this characteristic to be rare, but in these hills at any rate it is very common, as the above figures show. I have two specimens which exhibit only one small scale on one side only (fig. 2).

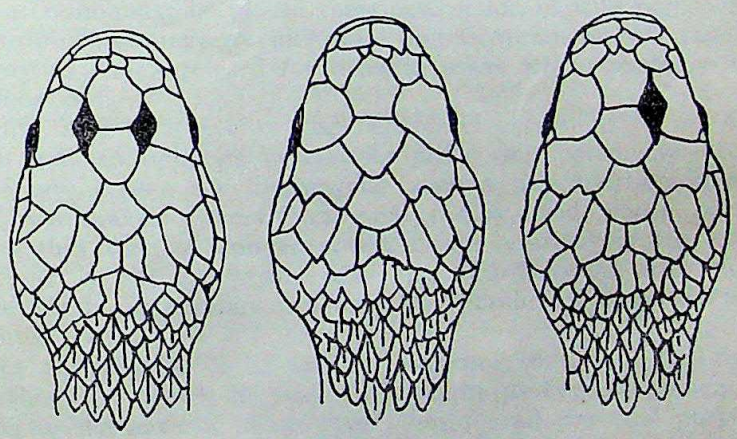


Fig. 1 Normal Fig. 2

Head of *Trimeresurus macrolepis* showing extra scales
(After Smith)

Trimeresurus malabaricus. (Tamil: Vyrian Pambu.)

Two small specimens were taken in the tea area. It does not appear to be common. They averaged 480 mm. in length.

Trimeresurus gramineus. Only one specimen taken at the far S.W. end of the hills in evergreen forest at about 3,800′: Not common. It measured 420 mm. in length.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Trimeresurus huttoni sp. nov. Two juveniles belonging to the same brood were taken from beneath an *Eeta* clump in the evergreen forest. A search failed to reveal others in the vicinity. This species has been fully described by Dr. Malcolm Smith elsewhere in this number of the *Journal* (p. 596.)

In concluding these notes I would like to express my gratitude to Dr. Malcolm Smith of the British Museum (Natural History) for his valuable help and suggestions, and to the Curator and staff of the B.N.H. Society, who have helped me with many of the identifications ; to those of my friends who have helped me with the collecting I also wish to express my thanks.

The majority of the snakes mentioned in these notes are in my own collection, some I am giving to the B.N.H.S. museum and some to the British Museum (Natural History). Most of my live specimens, which were duplicates, were released after examination.

(*To be continued*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

JUNGLE MEMORIES

BY

LT.-COL. E. G. PHYTHIAN-ADAMS, O.B.E., F.Z.S., I.A. (Retd.)

PART III—PANTHERS[1]

(With two plates)

'A panther looks what he really is, a perfect swine,' says Col. A. E. Stewart in his very instructive book *Tiger and other Game*. But while every sportsman will most certainly agree with his description of the tiger (man-eaters of course excepted), as 'a contented gentleman or an angry one, but always a gentleman', I do not think that many will accept his definition of the panther. After all the latter is only a smaller edition of the tiger, and that he lacks nobility is due solely to his lack of inches—in courage and grace he compares very favourably with his larger cousin. Cunning he most certainly is to the nth degree, but that makes him all the more difficult to bag, and to outwit him on his own ground needs the most careful attention to detail.

Some people regard panthers as vermin, and admittedly they can be at times a very serious nuisance, but on the other side of the account must be placed their destruction of wild pigs, which cause so much damage to cultivation that Government have found it necessary to pay a reward for them in areas where panthers have been shot out.

'Beauty is in the eye of the beholder,' according to an Arab proverb and so opinions necessarily differ, but personally I cannot see any reason for disparaging such a fine sporting animal, whose skin makes a very handsome trophy, and whose pursuit involves that risk of danger which is the essence of big game shikar. It is not every one who can afford to go after tiger, but the needy sportsman will find the panther a very passable substitute.

Since the panther is in fact a miniature edition of the tiger, the methods by which he may be brought to bag are much the same as in the case of 'Tom Puss', but for all practical purposes they may be divided into three heads—beating, sitting up, and chance-met.

Beating for panthers is seldom successful, as they can run up a tree like a cat, or lie low in a bush not much bigger than a teapot and so remain unseen when the beaters pass, while if they are driven forward the chances are that they will pass unnoticed

---

[1] To avoid confusion with the Cheetah or Hunting Leopard, I have throughout used the name Panther in preference to Leopard, but there is, of course, no difference whatever between the two names.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

unless the stops are very carefully placed and the guns are well concealed. For the same reasons chance encounters are no more frequent than in the case of tigers, and the normal method of bringing a panther bag is by sitting up, either in a tree or on the ground over a bait, which may be the remains of an animal already killed or, as is more usually the case, over a live goat, whose bleating serves to attract the panther. Generally speaking I have found that sitting up over an animal already killed is more likely to produce results than the latter method, owing to the fact that the panther is already located, whereas with a goat he may not be within hearing. But it would be a great mistake to suppose that either method is infallible—even with the greatest attention to detail the result is by no means a certainty, while without that attention, sitting up is largely waste of time. I certainly sat up more than 20 times before I saw a panther at all, largely due, as I now realise, to lack of elementary precautions, and the lessons I have learnt are now being passed on for the benefit of others. It is of course impossible to guarantee success, but after all who wants more than a reasonable chance? 'Sport reduced to a certainty is sport robbed of its essence,' saying Thomas in *The Rod in India*, and that applies as much to shooting as it does to fishing.

My First Panther

There is no truer saying as regards shikar than 'C'est le premier pas qui coute'. In the first 5 years of my service in India I had shot tiger, bear, oorial, gooral, black buck, chinkara & kakur, but I simply could not get a panther. Following the advice of other sportsmen I sat up again and again, but without result, and it seemed as if I was fated never to see a panther. Then in 1909 my luck at last turned, and after that I had no further difficulty.

During divisional manouevres near Poona I noticed some hills north of Khadkala railway station which were said always to hold panther, so as soon as work permitted I obtained 3 days leave, and went into camp near the village of Somawrie. On arrival I was informed that a panther was lying up not far away, so the following day was spent in beating the slopes, but no panther appeared though I bagged a kakur, and a pig for the villagers. Next morning I started about 9 a.m. to honk the slopes above Jamboli, when a man ran up with news of a panther just seen to enter some thick jungle at the foot of a long spur, so I hurried off in the new direction. My first position was on the top of the steep bank of a nullah running uphill—the latter was about 100 yards broad and covered with jungle, and as I could not command the whole, I put a man in a tree opposite me on the far side. Not long after the beat commenced he signalled silently that the panther had passed below him, so I doubled about 400 yards uphill as hard as I could go to a place where the nullah was much narrower and I could command the whole. About 10 minutes later I heard something moving in the bushes and the panther came out some 50 yards away, quite unconscious of my presence though I was sitting in the open on a bare sloping rock not more than 15 feet above it. I fired at its shoulder with my No. 2 Express and knocked it over—it got up

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

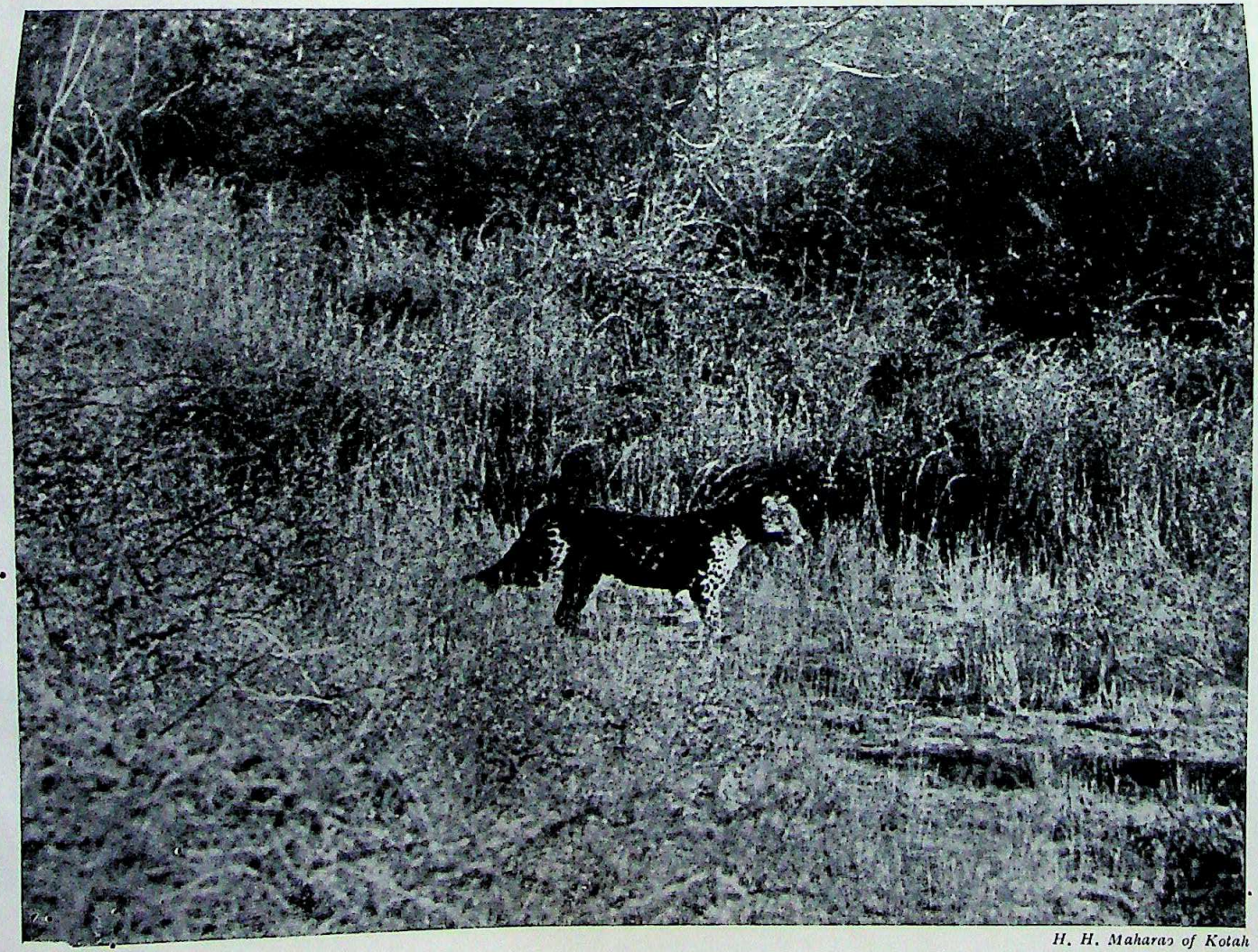


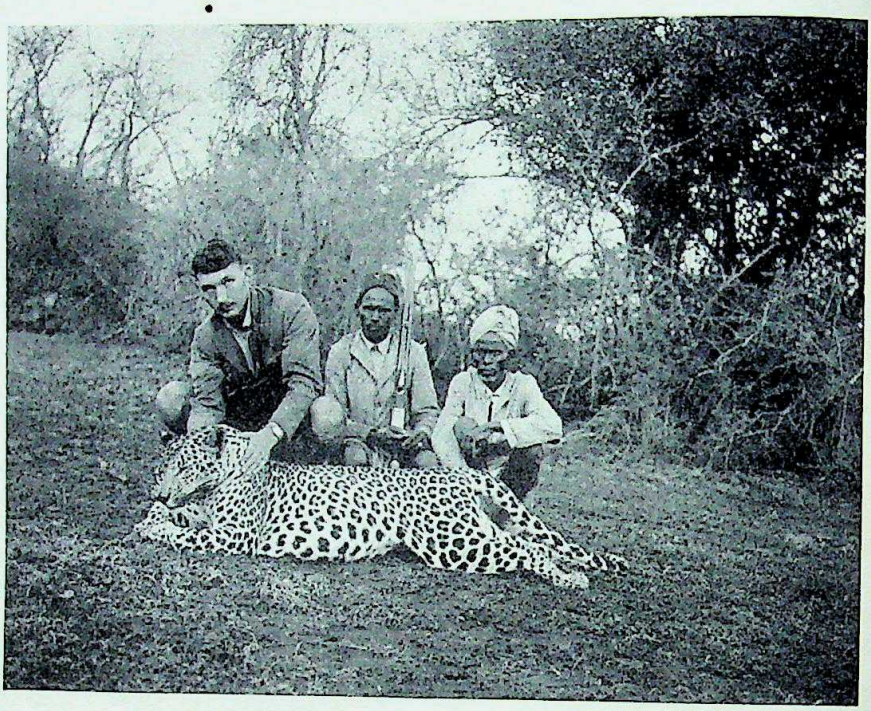
Photo *H. H. Maharao of Kotah*

A panther sights the tie-up.

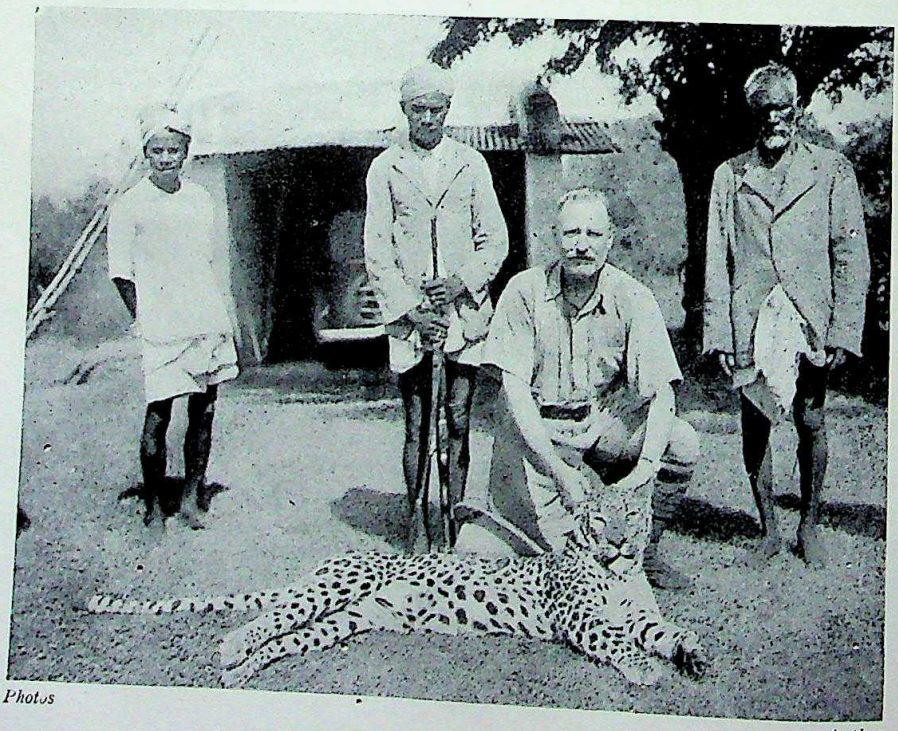
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Digitized by Arya Samaj Foundation Chennai and eGangotri



A big male shot at Anaikatti.



Photos *Author*

An Anaikatti panther with Kasabas.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

again however with a roar and rushed uphill, when I got in another shot, a little low. Finding the hill too steep for its broken shoulder it turned back and lay up in the middle of a patch of thick cover some 50 yards long by 30 across in the bed of the nullah. Meanwhile the beaters had come up, so I ringed the place with some men up trees while the rest tried to stone it out towards me, but beyond extracting some savage growls and moving the brute 5 yards their efforts had no result. Knowing that the panther was badly wounded I called a stand-fast for half an hour—the monotony of waiting being relieved by a black pye dog which rushed into the cover and came out a lot quicker than he went in. Shortly after, a Bhil on the other side of the nullah who had partly descended the steep bank, said he could see the panther, and let fly with an arrow—she was out after him like a flash with a roar of rage and with the arrow sticking in her flank. The man dropped his bow and bolted uphill, and everyone roared with laughter. She was too crippled to follow him and withdrew to the thicket before I could get a shot in. Obviously the next move devolved on me so I crossed the nullah higher up and went down to where the Bhil had been. After some minutes I made out a patch of skin and fired, hitting as I afterwards found about the shoulder—that moved her a few yards and I then cautiously entered the jungle. At first I could see nothing in the chequer work of light and shade which blended so well with her coat, but at last made her out only 10 yards away and gave her a finisher with a shot through the back. The first 3 shots had all hit on or nearly on the shoulder (440 grain copper tubed bullets) and the vitality she showed was amazing. I have noticed in other cases that a shot a little off-centre is often attended with similar results, and that further shots, unless they hit the bull's-eye, tend rather to increased resistance—the explanation is I believe the secretion of adrenaline.

And so all was well and at last I had bagged my first panther—an old female with a very dark skin—not much in size but that did not matter! When skinning her we found the stomach distended with meat—the beaters had driven her off the carcase of a bullock killed overnight, and were delighted at her death, as she had been giving a lot of trouble. Nearly 40 years have elapsed but the memory of that day is still clear, and above all I shall never forget the picture she made as she chased the Bhil with the arrow sticking in her flank. I don't know that there is any particular lesson to be learned from the episode except that no liberties can be taken even with a badly wounded animal.

Beating.

The following extracts from my diary show how disappointing beating for panthers can be in spite of my initial success:—April 20th. Another panther reported to be lying up over kill in deep glen N.N.W. of Rakaswadi, so beat for him but he broke out at side and came across plain to some jungle close to camp. Continued beating and shot a nice kakur. On return to camp at 5.30 p.m. heard about panther but decided it was too late to beat—had I

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

done so I should probably have got him, as he had killed and was lying up only 800 yards away.

21st. The man who went to look at goat tied up last night near camp walked on top of panther which had killed heifer last evening. We ringed him and I hurried uphill to cover his line of retreat, but the beat was blank as he had broken back due to beaters not keeping line. Went uphill and beat slopes from camp to Jamboli but saw nothing except a mouse-deer which came under my tree and at which of course I could not fire. Sat up in evening over kill but without result.

22nd. Went out before dawn and got on to line of retreat from kill. At 7 a.m. the shikari and a few others went to kill and made a little noise—the idea being that the panther would come out to me, but he had left before I arrived after eating more of the kill. Sat up over kill in evening—panther came within 50 yards judging by the monkeys cursing but would not touch the goat which I had tied up. Left goat out when I returned to camp at 8 p.m.

23rd. Off before dawn and found panther had again anticipated us—the goat had been killed and beyond the blood we could find no trace of it. Collected some men and beat the south hill from end to end, seeing nothing but fresh pugs of this panther and a smaller one. Then beat slopes on far side of hill and saw panther some 400 yards away race along in front of the beaters with his tail on end—he was just below the crest so they could not see him. The men beat well but he lay low or broke out somewhere.

24th. Beat the north hills but all we saw was a huge boar which I missed as he passed me at a gallop in the last beat. On the following day my leave being up I had to return to Poona.

My lack of success sitting up was due to the machan not being properly screened, and it was a mistake leaving out at night so small an animal as a goat—a young buffalo or a donkey would have been better. I see from my diary that beaters then cost only 4 as. per diem—what a contrast with prices today! I often wonder what the place is like now—quite probably the area is submerged by the lake which was formed some years later.

My experiences on that trip convinced me that except under specially favourable circumstances it is far better to sit up for panther, and the great majority of the 62 of which I have records have been obtained by that method. I have occasionally beaten for them in the years between, but do not remember ever getting a shot except once near Prome (Burma) in 1913, when an animal rushed past me in knee-high grass and a lucky snapshot rolled it over. And then I discovered to my regret that it was not the panther at all but an unfortunate monkey—however the Burmans ate it so it was not wasted!

Night Shooting

My first success sitting up was during a month's trip to Raipur in the Central Provinces in 1910. Some cattle had managed to get out of the village close to my camp during the night of the 3rd April, and a panther had killed one and mauled another as they were eating mhowa. I had a machan erected in a convenient tree,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and since there was no moon and the panther could not be expected till after dark so close to the village, I fixed a small electric lamp to shine on the kill. I was in position by 6 p.m. but it was not till 8.15 than I heard the sound of tearing. I raised my rifle and completed the circuit of the lamp, and then saw the panther behind the kill apparently petrified by the light. My shot was answered by a roar, but the lamp failed and I had to fire the left barrel at a venture, hitting as I afterwards found, the kill. I followed this up by a dose of buckshot from the 12 bore which apparently also missed. Soon after lights appeared from my camp which was only a few hundred yards away. The men came on carelessly in spite of my warning them, and my chokra Karim nearly walked on the top of the panther. He roared and they all bolted—fortunately no harm was done. I sent for more lamps and then got down from the machan and walked the panther up. At 10 yards he roared again and the lampmen wavered but I encouraged them and went a bit closer, when I was able to put in a finishing shot. He was a fine male. The first shot had caught him behind the shoulder high up and broken his back. I guessed that he was anchored or I would have left him till next morning. An interesting sequel was that when skinning him we found a large iron arrow head 4½ inches long by 1⅗ board under the skin of the head; the wound had completely healed, and all that was visible externally was the end of the shaft which was turned up at right angles and protruded near the ear. I have the arrow head still and have often wondered what happened to the man who loosed it; the local villagers could tell me nothing. From my diary I see that after the carcase had been cleaned up by vultures, one of the latter fell dead from the sky about noon close to my tent with a tremendous thud. The body was burst open from its impact with the ground and there was nothing to show the cause of death. I can only imagine that it had over-eaten and died of apoplexy!

Panther's Sense of Smell

Hearing that there were always a couple of panthers hanging round Visapur fort within easy reach from Poona, I went out there for a weekend to reconnoitre. I took only a bivouac tent and as little kit as possible, since everything had to be carried up the bad hill path over the col between the Visapur and Lohodgarh forts. I pitched my tent under a fig tree close up against the cliff face of Lohodgarh, and spent the next 2 days with Bandoo the local shikari exploring the country and the extremely interesting ruins and caves in the vicinity. I found that there were two water holes not far from the village—one under the southern slopes of Lohodgarh and one above the col between the two forts—and I tied up goats at both by night but without result. I then had to return to Poona, but left my camp standing with my orderly in charge and 3 goats to tie up. Some days later I received a prearranged telegram reporting kills, so got 3 days' leave and went out again. I sat up at what I named the 'South water' and after dark saw an indistinct shape approach the goat, which when I turned on my lamp, proved to be a hyena. He and the goat stood nose to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nose for quite half a minute, when I threw a cartridge at him and he bolted. I gave it up at 9.30 p.m. 'being eaten alive by large black ants' according to my diary! Next night I sat up near the col not far from camp, below a high bank, and a panther came down-hill behind and almost on the top of me before he bolted. To shoot was impossible. If I had had any sense I ought then to have given it up and returned to camp, but I continued sitting up the whole night, with of course no result. But I have at least one memory of that occasion—a magnificent view of Halley's comet spread across the sky above the ramparts of Lohodgarh, and a tree below the cluff face scintillating with hundreds of fireflies.

On the 3rd night the goat at the col was killed and carried off into some fairly dense but low jungle north of the fort, so I beat for it, sitting myself at the end of the 'Scorpions sting'—then tried the south side, and then back to camp, but though the panther was in each beat, I never saw it. I next went and looked at the kill which had been found in the first beat and put up a sapling by a beater. The jungle was so low that I could not find a tree for the machan nearer than 50 yards from the spot where the kill had been found, so I had the latter dragged 3 times to and fro to leave a trail, and finally pegged down in front of me. The machan was terribly exposed and only 8 feet from the ground (no higher tree was available) and when I climbed into it at 4 p.m. I had little hope of success, but there are times when everything goes right, and this was one of them. At 4.30 p.m. the panther suddenly materialised where it had left the goat, and then came across the open towards the machan noising the drag line just like a dog. When it reached the kill it sat up and licked itself. All the time I had been sitting rigid, but when it turned its back, only 10 feet from me, I very slowly raised the rifle and shot it through the spine—a young female with an abnormally long tail. I see from my diary that I had to skin it myself as no chamars were available. The episode is I think of special interest, as it shows that panthers do possess far more than a rudimentary sense of smell. The kill was comparatively fresh and not really 'fruity', so there cannot have been a great deal of scent, and yet this panther was able to nose it out and follow the trail. For the rest, it is hard to say which was the bigger B.F.—myself for sitting up in such an exposed position or the panther for not spotting me!

Shooting from a Pit

While on recruiting duty in 1915, I heard that a man had been mauled by a panther near Bommasamudram village about 10 miles from Vellore, so on the 16th April went out to prospect. Not far from the village was a long hill covered with scrub jungle, and with numerous caves formed by huge rocks piled one upon the other—an ideal place for panther. I spent the morning bombing some caves with rockets and exploring the larger ones. The latter sounds rather a foolhardy proceeding but I had read that tigers were obtained this way in Korea. However, nothing resulted and as there were no trees for a machan nor bushes thick enough for a hide, I had a dug-out made in an open field some 100 yards from

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the hill. My diary unfortunately does not give the dimensions of the pit, but I remember that it was big enough to hold myself and my orderly. It was roofed with poles, bushes and grass over which earth was spread and levelled out to match the surrounding ground. There was a small loophole not more than a foot high and about 6 inches broad, and the hole for ingress was closed by a bush. When completed it was very hard to distinguish even from a short distance. The bait was a sheep, as no goats could be obtained, and a small pye-dog was also tied up to add attraction. Nothing happened the first night though I was pretty sure that the panther was in the vicinity, and on the second night I put my orderly in the pit with a single barrel 12 bore while I sat up elsewhere. About 10 p.m. I heard a shot from the dug-out and shouts, so went over and found that the panther had killed the sheep and that the orderly had fired but missed it. I returned to my own hide and half an hour later heard 2 more shots. This time there was no mistake and a fine male panther lay dead alongside the sheep; the pye puppy—poor little beast—was untouched. This panther had mauled 3 men and the villagers had been afraid to leave their houses after dark for some months past, so he was well out of the way. When skinning I found a lot of prickly-pear thorns in chest, fore-arms and tail all turned quite black; they cannot have improved his temper.

The same dug-out was used a month later with equally successful results, and this method is recommended when the ground is open and no suitable tree or bush is handy. But the stifling heat is a drawback, and also the difficulty of firing through such a small loophole. One has to be very careful too not to get earth down the barrel of the weapon. Both these panthers were shot with Destructor bullets from a 12 bore, and were laid out on the spot. Under such conditions an electric light is out of the question so the brighter the moon the better. If possible the bait should be outlined against the sky, and not more than 5 yards away from the loophole.

The Ghatkesara Panthers

No further opportunities with panthers occurred till 1921, when I rejoined my regiment in Secunderabad after its return from Mesopotamia. From General E. F. Burton's *Indian Olio* I knew that Secunderabad had been a good sporting centre in days gone by, so as soon as we had settled down I started exploring the various roads out of the station. One afternoon towards the end of April I went down the Bhongir road about 14 miles and spotted a very likely looking hill near the village Ghatkesara. It was the usual Deccan type of kopje, with a number of thorny bushes scattered over it, while huge piles of rocks indicated caves. Local enquiries elicited the information that a panther had killed several goats recently, so I engaged a Secunderabad shikari and sent him to make the necessary arrangements. On the 1st May I went out again and after a very hot run reached the village about 5 p.m. The shikari had fixed up a hide of bushes (locally known as a 'mart') at the edge of a small dry tank at the foot of the hill, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the goat was tethered about 15 yards away. I sat up till 7.30 p.m. when I gave it up as there was no moon. Next evening when I reached the village the shikari told me that the panther had followed us back almost to the road, and later had killed a goat which he had taken into a small cave in low rocks at the base of the hill. This time the machan was in a tree and the goat about 7 yards away; I fixed up the electric lamp and got into position about 5.30 p.m. At 7.30 there was a sudden rush and the panther seized the goat, broke the rope and was away up the hill before I could raise my rifle. I heard him tear the goat open not far off,—that unmistakable sound of a feline feeding—but it was useless going after him. So I quietly left my machan in order not to disturb him (with a view to future eventualities) and went back to the men, who were waiting some 400 yards away. With more experience I should have realised that this was a big male panther and not the one I had been trying for till then; however I was to deal with him in due course. Next evening found me sitting up again, this time in a mart on the ground at the foot of the hill. Till dusk I kept the rifle handy, but after that changed it for the 12 bore with a Lethal bullet in the right and buck-shot in the left. I had an electric lamp fixed to a bush some yards away from my hide, and at 8.30 p.m. feeling it was hopeless to stay longer told the shikari to turn on the light to test it. I saw what looked like a panther some 30 yards beyond the goat, but the light went out before I could be certain. However, when it was turned on again I saw a small panther walking past behind the goat, and had a quick shot but missed. After this I determined to give him a couple of days to get over his scare, but on the 6th May was back again with a new plan. I felt sure that the goat had been tied too close on previous occasions and that the panther was shy of any suspicious looking bush, so ordered the goat to be tethered 70 yards away when the flock was driven past. I watched till dusk but nothing happened, so I withdrew to a machan previously prepared, and had the goat fastened within close range. While we were moving back the shikari told me that he had seen the panther on the rocks and that he was sure to follow us. He did so, but it was too dark to see him under my tree, and as he refused the goat I had to give it up. It was disappointing to have spent so much time and trouble in vain but I felt sure that perseverance would in due course be rewarded, and next evening was to prove me right.

I purposely arrived earlier than usual, and by 5 p.m. was in my hide between two big rocks with the entrance well bushed—the goat was tethered 70 yards away and called well. At 6.30 p.m. I saw the panther sitting on the rocks beyond staring down at the goat, and fired at his shoulder, but underestimated the distance and the bullet struck low, tearing the skin off his chest and the muscles of his fore-arm, as I found later. At the shot he made a tremendous bound high in the air, landing some 20 feet down, and then turned and looked up at the rock he had just left, evidently wondering where that nasty blow had come from. I stood up and fired again but apparently missed, and he turned up the ravine

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

at a slow trot. I jumped on to a rock and had 2 more snapshots both of which hit him as I knew by his answering roar. At the head of the ravine he turned left and tried to get back to his cave, but a rock he had to climb was too much for him and just before he reached the top he fell back. A cautious approach showed him lying dead—a small male with a long tail.

After a couple of days I went out again to prospect and found, as I should have realised before, that there was still another panther, a big male which had killed 3 goats near a well the night before. It was then too late to do anything, but next evening found me at 5.15 p.m. in a mart among the rocks at the foot of the kopje with the goat 70 yards away. The position was however badly chosen as I could not see the panther if he came out of his cave or till he was near the goat. At 6.45 p.m. I got fed up and whistled up the men, and as we went to untie the goat I thought I saw something move in the bushes 50 yards away halfway up the hill, but could not be certain—it might have been a hare but may have been the panther. Thinking matters over I felt sure that we were wasting our time working the west side of the kopje which overlooked both the railway and the main road not far distant, whereas the east side was towards the open country and the panther might be expected to emerge earlier. On the 12th afternoon I therefore occupied a hide overlooking the east slope; the flock of goats was driven right over the kopje, and as they passed one was tethered about 50 yards below me at the foot of the hill. The flock had not gone 5 minutes before the panther appeared in the mouth of the cave about 150 yards away—after a good look all round and at the goat he lay down and surveyed the country for a full hour. Satisfied at length that all was well, he then started to come down the hill and it was a pretty sight watching the stalk. At one place, evidently out of view of the goat, he sat down on a sloping rock and slithered down till it became too steep when he jumped the remainder. He was still too far for a shot, and by the time he had got within 30 yards of the goat it was getting dark and I could hardly distinguish him even with my glasses. I did not want the goat killed unnecessarily, so quietly left my hide, unfastened the goat and went downhill whistling to the men who were some 400 yards away. I neither saw nor heard the panther go, but of course he did. Evidently he was a bit puzzled, as after I had left he walked round and round the place where the goat had been tied, and also rolled in the sand there.

Next evening saw me in another hide by 5.15 p.m.—this time at the foot of the rocks at the south end of the kopje. The goat was below me and about 15 yards away. My position thus covered from a flank the panther's probable line of approach. As on the day before, the flock had not been gone 5 minutes before the panther came out of the cave. He was hungry for, so far as we knew, he had killed nothing for 4 days, and within a few minutes he started to descend. Half way down the hill he turned up a cleft of rocks away from me and I nearly fired, but he had bounded up too quickly. A minute later I saw a bit of him as he took up a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

position in the shade behind a large rock. All I could make out were his head and paws for the next 45 minutes, and several times I thought of firing but the shot was a difficult one, and I hoped that by waiting I might have a better opportunity. Besides making a general survey of the country he several times stared intently at the hide, and if I and the orderly had not kept absolutely motionless he would certainly have spotted us; he had good cause for suspicion as we found later. At last about 6.30 p.m. his head was withdrawn and I knew that he would shortly re-appear in the cleft, so got ready to shoot. Just as he was about to jump down I fired at his throat. He fell over and for a few seconds was motionless, then got up and went behind the rock where he had been lying so long. I climbed on to a boulder and saw him standing still, looking very sick, halfway up to the cave. I fired again but was unsteady and missed, and before I could reload he had reached the cave. The approach to it up the hill was not pleasant but there was no other way, so taking the 12 bore loaded with buckshot and closely supported by my orderly with the .405 Winchester, I cautiously advanced. A heavy blood trail led to the cave, inside which we could hear a deep sound of breathing. The cave mouth was wide but I could at first see nothing, till the shikari pointed out the panther lying in a cleft between two rocks about 5 yards away—he was motionless but still breathing so I brained him. The first shot had broken the left lower jaw and passed on into the body, nearly coming out behind the left shoulder, so he would not have lived long in any case. He was a fine male and had an old wound on the withers apparently from a small bore rifle. The injury was on both sides of the spine, and must have been caused by a bullet fired when he was crouching, otherwise his back must inevitably have been broken. The new hair was just growing round it—no wonder we had so much trouble bringing him to bag. I remember that when we got back to my bungalow in Secunderabad, every dog in the neighbourhood started to bark furiously, having no doubt got the panther's scent.

A fortnight later I shot 2 more panthers a few miles further on, both at the first attempt. One came on to the rocks overlooking the goat and I killed him with a single shot from the hide. The second was spotted sunning himself on some rocks on our way out and a long shot at him missed, but this did not deter him from following us and rushing the goat at dusk. I fired at what I thought was the centre of his chest, but the bullet went through the loose skin of the armpit. He rushed straight downhill at us and I had just time to stand up and fire a point blank shot into his face. I do not for a moment suppose that he was charging; no doubt he was simply bolting away from the echo of the shot, and the crack of the bullet on the rock behind him. But all the same it was closer work than I like and shows how desirable it is to be above the goat. In this case there was no alternative to siting the hide downhill.

At the risk of being tedious, I have dealt with the first two of these panthers at some length, to show how necessary patience is to circumvent these cunning brutes. Altogether it took me

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

nearly a fortnight to bring them both to bag, and I sat up eight times. With more care in selecting the sites for the hides, time would undoubtedly have been saved, but I had my duties to attend to in Secunderabad and could not get away till the afternoons, so had to leave most of the arrangements to my shikari. Even so, and granting that one of the panthers was unusually suspicious owing to his former wound, I feel sure that more personal attention would have produced a quicker result. Later on I shall give full details regarding the construction of hides and bandobust generally, so will only add here that except in very special cases it is better to tie up the goat within 15 yards of the hide, and that 70 yards was much too far.

Machan Shooting

Having dealt with sitting up on rocky ground, I will now select some incidents of shooting from a machan which seem to me of special interest. The first was in December 1929 when one of my young buffaloes was reported killed on the Sirur road about a mile from the Forest Rest House at Anaikatti. I sent two men to put up a machan, warning them to be particularly careful to cut the wood some distance away, and also to screen the machan all round. News then arrived of a second kill across the river some miles away in the opposite direction, so I proceeded there and had several beats which proved blank. I was back at the bungalow by 2.45 p.m. and after a hurried meal left to sit up just as a message arrived asking me to hurry since the panther was on the move. By 4 p.m. I was in the machan which had been built in one of a number of close growing trees in the bed of a nullah. The kill was about 20 yards distant—all one hind quarter had been eaten and the whole stomach carefully removed, which indicated a large panther, as indeed his pugs showed him to be. He was expected to return either in front or to the right, but I was not too happy about the nullah behind me, as the machan, in spite of my instructions, was not well screened on that side. However there was no time to do anything as a sambar was persistently belling uphill and the panther was obviously not far off. At 4.30 p.m. a red mongoose arrived and it was very amusing to watch her—I say 'her' because from the size it was obviously a female in what is sometimes described as 'an interesting condition'! She worked round and round the kill and took at least half an hour to decide that it was safe to approach, when she at last started feeding, her mate joining her shortly after. The sambar was again belling at 6 p.m. and as I calculated that the panther was still some distance away, I took the opportunity, before the light failed, to fit the electric torch to the side of my 12 bore—which of course I ought to have done as soon as I got into the machan. I had not used one before and failed to realise that some noise was inevitable. However it did not seem to worry the mongooses. Half an hour later the light went, and at 6.45 p.m. I saw the panther, a grey nebulous shape, coming from under my machan towards the kill. I waited till it started eating, and then raised my gun, but in spite of all my care the torch clinked against the barrel and then

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

came off in my left hand, so that I had to fire with the right only. I felt sure that I had put the charge of buckshot into his shoulder, but he did not answer the shot and we never saw him again, nor did a search at dawn reveal any blood or other signs. That I lost him was entirely my own fault; I should have seen to the proper fitting of the torch as soon as I got into the machan, and it would have been far better to have used the rifle. Buckshot is all right for close range and especially for following in thick cover, but it leaves no blood trail as a bullet does.

In September 1936 I was again in camp at Anaikatti, this time accompanied by a friend. We had two young buffaloes tied up and the first night one was killed, so having won the toss, I went to sit up the following evening. The machan was in a fine tamarind tree overlooking a broad sandy nullah in which lay the kill some 15 yards distant. Only a little had been eaten off the buttocks so the panther might be expected early—in fact the man who was keeping the vultures off told me that it had approached a short time before but had been driven away by a herd of Badaga buffaloes grazing in the vicinity. I had the latter shifted some distance and was settled in the machan by 4 p.m. It was very comfortable, and well hidden by the broad branches and heavy foliage of the old tree. By leaning back against the trunk I could keep an eye on the nullah to the right up which the panther had retired and by which she would presumably return. Time passed pleasantly watching a small white-bellied drongo hawking insects, and a young white-browed fantail flycatcher being fed by its parents; it was amazingly tame and was often within arm's reach. At 5.45 p.m. out of the corner of my eye I saw the panther behind the tree coming towards the kill and on my left. She looked a pretty sight with the tip of her tail curled and her beautiful colouring in the evening light. Beneath the machan she stopped to look at the kill and under normal conditions I should have waited till she started feeding before I took the shot. But there was a path close by up which someone might pass and scare her away, so I determined to fire at once. Cautiously lifting the rifle I tried to point it at her and as I did so her hindquarters sank down. I feared that she had heard some slight movement of mine and that I had messed things up, but all was well, and by craning over I saw that she was sitting up beneath me and still gazing to her front. It was a most awkward shot, as I could not get the butt to my shoulder and had to fire the rifle rather after a fashion of a two-handed pistol, but the bullet went true, catching her between the shoulders and passing through the heart—she could not have been 12 feet away from the muzzle. After a few gasps she lay still and I whistled up the men who were delighted that I had at last broken my run of bad luck in these jungles. She was an old female with blunted upper canines and taped 6 feet 6 inches between pegs.

We had hardly started back when my driver G. who was with me, saw a panther's head peering out of the bushes, so I was not surprised to learn next morning that two panthers had visited the kill during the night and gorged heavily. It was B.'s turn

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to sit up and I urged him to take a torch as I felt sure that after such a heavy meal the panthers would not return till after dark, but he was prejudiced against the use of artificial light (every one is of course entitled to his own opinion), with the result that when they arrived he could not see to shoot. The panthers were very noisy, and were probably trying to intimidate a hyena, which was shot later the same night by G. who relieved B. at 8 p.m., after the latter had given it up as a bad job. If B. had only taken a torch he would at least have been able to see what was going on beneath him, and almost certainly have got a shot.

December of the same year found me back again at Anaikatti, and on the 27th my shikari Kunmada, reported that a large cow had been killed by a panther the night before, close to the village. Only a little of the brisket and some guts had been eaten so an early return might be expected. The ground was dry and hard, and the short grass showed no pug marks. The machan was in a 'ber' tree, very low and insecure, with the loophole looking down at the kill not 10 feet away, and I was not very hopeful as it was not well screened and the slightest move would be detected. I was in position by 4.15 p.m. and half an hour later six buffaloes came down the path and sniffed at the kill. One licked the dead eye, another blundered into my tree and shook the machan, but after some snorting they finally cleared off. Before 5 p.m. I heard a peafowl trumpet (that sure sign of a feline and quite different from the normal call) not far away, followed by the sounds of startled flight—possibly the panther had made an attempt at it—next, spotted deer called within 70 yards. Two grey mongooses appeared and ran round the kill but did not stay, and then I heard a bird twittering down the path behind me. Cautiously looking over my shoulder I watched that side but could see nothing, then facing round saw a panther sitting in front looking at the kill not 15 yards off. A mass of overhanging branches prevented a shot, so I had to wait, but that did not matter as there was still plenty of time before dusk. A few minutes later the panther rose, went back 10 yards and lay down, when a second appeared on the scene and approached the first, which greeted its mate by arching its tail over its back. The second panther then came towards the kill and when only 5 yards away spotted the machan and gazed at it intently. My loophole was a large one for night work and I must have been pretty visible; her eyes met mine and she turned and went off at a fast walk. I was afraid my chance was gone, but peering over the top of the screen I saw No. 1 beyond some bushes standing sideways on about 40 yards away and looking after No. 2. Luckily I had a clear view of his shoulder so fired. There was a flurry of dust and he was gone, but I heard him rolling about not far away. Calling up the men we found a good blood trail but the bullet had obviously passed through, and as the bushes were very thick I sent back to the bungalow for my 12 bore and buckshot cartridges, and for the dog. On their arrival about 6 p.m. we again advanced stoning the bushes, and turning a corner saw the panther lying dead—a male of 6 feet 10 inches but with a long tail. I was

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

lucky to get this panther at all, after being spotted in the machan, which was my own fault for leaving such a large loophole. I should have blocked it with leaves till it was required.

I decided to sit up for the female on the following evening and selected another tree for the purpose, but that night hyenas completely demolished the kill. In this case it was obviously necessary to shift the machan, but it will often happen that the same one can be used again, as shown in the account of the panther shot from the tamarind tree. I had a similar experience in May 1939 when R. sat up over a kill on the 25th and shot a panther. Another returned to the kill later the same night and I shot that one over a fresh tie-up on the 27th using the same machan.

In such cases the dried branches must of course be replaced with fresh ones, not only on account of visibility, but because withered leaves crackle with the slightest movement. Some books on shikar advocate bushing the underside of the machan—this seems to me not only unnecessary but likely to make it too bulky, and thus more liable to catch the eye of the approaching animal. Any ladder must of course be removed; nothing is more noticeable than a bamboo with branches cut short for this purpose. The machan itself must be well bushed *all round*, high enough to prevent the occupant being overlooked from higher ground, and thick enough from base to top to prevent any movement being seen. So far as possible one should sit motionless, but occasional movement is unavoidable to counteract stiffness; a rug and a thick cushion are aids to comfort. Some people find sitting up boring and take a book to read. Personally I prefer to watch the birds and the life of the jungle in general—it is only after dark that one finds the time drag. Smoking I feel sure is undesirable, since the smell of tobacco carries so far, and unmistakably indicates the presence of man, while the smoke rising above the machan may catch the animal's eye by day, or the glow of a cigarette after dark. It is definitely a privation for a heavy smoker like myself, but should be endured in a good cause. How long to sit up? If the panther has not come by 9 p.m., I doubt whether it is worth staying later. Much of course depends on when the kill took place and how much has been eaten; also whether the locality is a quiet one or liable to disturbance. Generally speaking it is better to sit up alone, but it is not at all a bad plan at times for the shikari to sit up with one and for him to leave the machan at dusk. If the panther has previously had suspicions, the sight of a man leaving may make him believe that all is clear. I have known this work on more than one occasion. If you have decided to sit up after dark, you will of course take with you some citronella oil or other anti-mosquito preparation, and will have arranged some form of electric light—either a torch clipped to the barrel of the rifle, or a small lamp directed to shine on the kill. I have seldom used these devices myself but cannot see any reasonable objection to them. The whole object of big game shikar should be to kill as cleanly as possible, and surely it is far better to use an electric light and make sure of your shot, than to fire more or less blindly in the dark and risk losing a wounded animal. One has quite

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

enough difficulties to cope with in any case without adding to them. If you are using a torch clipped to the rifle, your loophole must be large enough to accommodate both, but during daylight it should be reduced to minimum dimensions either with leaves or a green silk handkerchief. A stout bar beneath it will serve as a rifle rest while waiting, or to steady the weapon when taking a shot. If the sun is shining towards you, it will be better not to allow the muzzle of the weapon to project while waiting, lest some glint from it should catch the panther's eye.

Some books advocate a supply of stones to drive off the vultures, which if they have found the kill will quickly finish it, as soon as your men have withdrawn. I am inclined to think it is better to leave them undisturbed. Even if only bones remain, the panther is pretty sure to come and sniff at them to see whether anything is left, whereas if he finds the birds perched in the trees, he is liable to be suspicious. Panthers have a habit of approaching a kill by stages, and if he happens to be watching from a short distance when a stone is thrown, he will realise that there is something uncanny about the spot, and your chance will be gone. As regards taking the shot, it will be best to take the first suitable opportunity, as something may occur to disturb the panther and he may not return. You will of course load your rifle as soon as you are settled into the machan, and put the safety-catch on—rifles have before now slipped from the machan and exploded on reaching the ground. It is equally important to unload your weapon before descending. All these may seem unnecessary details, but it is by attention to them that success will be achieved. The most important point of all is rigid immobility and a minimum of movement. Do not believe because you cannot see in the dark that a panther is equally hadicapped—his vision is quite as keen by night as by day.

Sitting up on the Ground

When sitting up over a kill, if no tree is available for the machan, a hide can be made on the ground by hollowing out and thickening a bush, and the same method may be adopted when sitting up over a live goat, as the following case shows.

In November 1930 I was shooting green pigeons down the Chamrajnagar road about 3 miles from Gundlupet, when a villager told me that a panther had killed his cow overnight. Except for scattered clumps of lantana there was no cover for miles, but a search revealed a fine animal lying dead in some bushes not 50 yards from the main road. I thought it best not to disturb the locality by beating, and as the ground did not permit the construction of a hide covering the kill, I had a bush hollowed out a short distance away and sat up over a live goat that afternoon. The men had not left me 3 minutes when there was a rush and the panther had seized the goat; a shot through the head finished the matter. This case shows how a panther may be attracted by the lure of a live bait, even though its kill is fresh and only partly eaten.

But such easy success is not often achieved, and though I have shot many panthers from a hide on the ground, I doubt

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

whether this method offers on an average more than a 1 in 3 chance, for a variety of reasons. The panther may not be in the vicinity at all, or he may be too suspicious to take the goat before dusk (I now never sit up on the ground later than that), or he may spot the occupant in the hide and refuse to kill, while the goat may also decline to call, though that can be overcome by having a second goat handy to answer your tie-up, or if necessary to replace it. Difficulties however are the essence of sport, and personally I find this method an extremely attractive one—in fact it has given me most of my panthers—so I will now select some examples from my diary.

When I first visited Gundlupet in the Mysore district in 1926, there were a lot of panthers about, constantly killing goats and cattle, but the local shikaries were simply small-game men and knew nothing about panther shikar. Consequently I had to make all the bandobust myself, which after all is the most satisfactory way. On my first visit there was no time to prospect, so relying on information received, I sat up over a goat at the foot of a hill about one mile from the travellers' bungalow, but as might be expected, without result. Next morning I pushed further afield and found fresh pug marks of panther near the edge of State Forest beyond the village of Bhimanbid, and the cowherds informed me that one usually lay up in a thicket close to an old tank—a very likely spot. A cart track ran past this, and I found that the only suitable bush was on the far side of it, so constructed a hide there. I was in position by 5 p.m. with the goat 15 yards away across the road and close to the thicket. It was not an ideal place as herds of cattle were continually being driven past on their way back to the village, but about 6.30 p.m. things got quieter, and I then heard some birds twittering in the bushes uphill behind me, and later a squirrel in a banyan tree on my left—obviously the panther was on the wrong side of the road and not in the tank thicket at all. At 6.40 p.m. a single man passed hurriedly down the road—we learnt afterwards that he had seen the panther crossing it. Ten minutes later there was a rush, and looking through my loophole I saw the panther holding the goat by the throat. The latter covered the panther's chest so I had to wait till it dropped unconscious and then fired a Lethal bullet from my 12 bore. At the shot the panther sprang forward a couple of yards, then fell and rolled about evidently badly hit, but I did not like to fire my left barrel, as his line of retreat would probably be past the open end of my hide, and I preferred to reserve it for close quarters; that is the drawback to a double barrel as compared with a magazine weapon. However after a few seconds the panther suddenly picked himself up and dashed away towards the old tank and my hurried second shot missed. It was now too dark to follow up, so we had to leave it till next day, when I spent over 2 hours searching the dense lantana thicket, covered by heavy stoning, and expecting a charge every second. But to make a long story short that panther was never retrieved, though with such a wound in his chest he cannot have gone far.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A bad start! but I did have the satisfaction of saving the goat by dressing the wounds with carbolic.

Next evening, after the usual reconnaissance, I sat up again about a mile away for another panther. The goat (not the same one!) was very nervous, and as soon as the men left flung itself to the ground where it lay tangled up with the rope, and uttering an occasional feeble bleat. After a few minutes, hearing no sound, I looked through the loophole, and saw a yellow spotted heap behind some low bushes a few yards beyond the goat—this materialised into a panther which rose and stared at the goat in some perplexity. This time I was using the rifle, but the shot was followed by the same performance as the day before—jump, tumble, rush and fruitless second shot. But this time I could see blood on its side as it dashed away, and there was a good blood trail for about 50 yards into a nasty thicket. I ringed it, and finding that the panther had not left, followed up the trail cautiously and soon saw it lying dead—a lanky female of 6 feet 10 inches.

I then had a run of bad luck and sat up 6 times without result. On one occasion the goat would not call (I had not then thought of having a second goat), and on another, though we had seen the panther on the rocks that morning, he refused to take the goat—quite possibly my topi was visible from the hill over the top of the hide, which was not high enough. Next morning he was on the rocks again accompanied by a mate and I tried a stalk. I might have had a shot at 200 yards but that was a good deal too far for certainty, so I did not fire, and after they had gone constructed a new hide in a cleft between two rocks. The male, whom I named 'Old Sala', had done me several times before, and as he was such a cunning beast I went out alone very early in the afternoon with a sari wrapped round me, and pretended to be an old woman picking up sticks. It was not very likely that he would be watching at that hour, but I was not taking any chances. Approaching the hide slowly and with constant halts, I got into position by 3.30 p.m. and the goat was tied up by 4 p.m. Soon after I heard birds chirp on the hill and at 4.20 p.m. there was a rush. I looked out and saw the goat lying dead and the panther with his ears laid flat looking all round at every bush and rock. Before he could spot me I shot him through the shoulder. He lurched off a couple of yards and then dropped—a very thickset old male with a head like a small tigress, but owing to a short tail he taped only 7 feet. Analysis shows that on this trip I sat up 10 times and got 3 panthers, so I think my estimate of a 1 in 3 chance is about correct.

A year later found me again sitting up in the hide from which I had wounded and lost the first panther. As before, cattle kept passing towards the village, and at 6 p.m. two men driving a herd began to beat their beasts vigorously, calling out 'Ibba—Ibba'. I knew they had seen the panther, so cautiously peeped through the loophole and saw its head 30 yards beyond the goat and staring at it—the latter was still looking in the direction the cattle had gone and had its back to the panther. I wanted to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

save the goat, so opened the loophole and pushed the rifle out, and as I did so the panther came forward at a crouching run, then sprang and seized the bait before I could shoot. I fired at the front of the left shoulder near the neck, and it dropped on the spot with the goat still twitching in its jaws. Not being quite certain whether it was dead, and remembering what had happened previously at the same spot, I stood up and fired again at the back of the neck and the shock of the bullet made it release the goat which however was dead. This was an old female with worn teeth but only 6 feet 5 inches in length. My diary records that first her head, and later as she advanced, her whole body looked uniform brown colour, with no sign of spots; this was in dull light with no sun. It is extraordinary how their colour appearance varies—at dawn or dusk they often look grey. No doubt the light has much to do with it and the angle at which the animal is seen, but I cannot help thinking there is something still to be learnt in connection with the position of the fur, when either lying flat or partly raised.

I remember some years later shooting from the same hide a panther which held the goat in such a way that its head covered the panther's chest. As I was sitting on the ground and on the same level as the panther, I did not care to take the head shot, which was all that offered, since the bullet might so easily glance off. So I fired at the goat's head which was of course blown to pieces; the panther was killed stone dead. Normally however a shot in the centre of the chest, or if sideways on through the shoulder and heart, will either lay the animal out on the spot, or it will be found dead within 50 yards, and generally much less.

One unusual case happened when the bullet must have exploded on the shoulder, and the panther, a small beast, rushed away leaving behind the ball and socket joint. With such a wound it is difficult to believe that any animal could go far, but this one got away without offering a second chance, though it was found dead next day. I remember that when following up rather casually I peered under a thick bush and found myself practically face to face with the animal, but fortunately it had no thought of retaliation. For following up I find the best weapon is a 12 bore loaded with buckshot—it is far handier than a rifle. But I prefer the latter for shooting from the hide.

As regards method of killing, my experience is that a panther seizes the goat by the throat and holds on till strangulation ensues, but large male panthers often exert such violence that the bait is killed on the spot. If the panther is shot before the goat is dead, the wounds in the latter's neck can be cured by washing out with carbolic solution. When a dog is tied up it may either be seized by the throat or killed outright by a bite at the back of the skull, but personally I never use a dog unless it is unavoidable, as the unfortunate beast, unlike a goat, realises only too well what is likely to happen.

I had an interesting experience in 1933 when two panthers, both young males, rushed the goat simultaneously. I shot the larger which was holding the goat, when the second seized it

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and stared at the hide only 14 yards away. Quickly reloading I fired again, when the goat, which incidentally bore no marks of either teeth or claws, stood up and sniffed at the nearest body. As my men approached they called out to know why I had fired twice, and would not believe that I had shot two panthers till they saw them lying dead close together. I quote this case to show that for all practical purposes a magazine rifle is just as good as a double barrel, and it has the advantage of further rounds in reserve, whereas the double takes an appreciable time to reload.

As will be seen from the episodes narrated above, by keeping a careful watch it is at times possible to shoot before the bait is seized. Twice I have seen a big male panther which had a kill nearby, come and inspect the goat without attacking it. At one I managed to get a shot and bagged what proved to be my largest panther, 7 feet 6½ inches between pegs, but the other spotted the rustle made by the leaves of the loophole as I pushed the rifle out, and was gone before I could take aim. On another occasion, a small female came at dusk and jumped several times right over the goat—she looked like a puff of smoke in the fading light, and as she gave no chance of a shot I had to collect the goat and come away. The above incidents are given to show how important it is to be constantly on the alert, but to relate further episodes of this type of shooting with all its inevitable failures, would be boring, so let the above suffice and let us now consider how to set about things.

How to make a Hide

We will assume that you have information of cattle or goats being killed in a certain area, but this is not enough; you must so far as possible locate your panther. I find the best plan is to go out in the morning and to ascertain from villagers and goat-herds when the last kills took place, and where the panther is in the habit of lying up. Then by circling round the spot and looking for tracks in nullahs and near water, try to locate him still closer. Unless you do this you will probably be wasting your time sitting up for a panther which may be miles away. A very likely place is a small rocky hill with caves, and we will assume that you have reason to believe the panther is lying up in one. The next thing is to decide the location of the hide, which postulates a thick bush about 4 feet high, and an open space to tie up the goat about 15 yards away, and in view of the hill. This is important, though in the case of a thicket, the goat's bleating alone should suffice. In any case the goat MUST be up-wind of the hide, or he will recognise your presence, and fail to do his little bit. The panther's probable line of approach must also be considered, and if you can flank it, so much the better. Make the hide NOW, and do not put it off till the afternoon—the less disturbance there is *then*, so much the better. Having selected your bush, hollow it out and thicken the inside with branches and leaves from top to bottom, not forgetting the lower part, or the movement of your feet may give you away. Your object is to secure complete protection from view without altering the external appearance of the bush,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

so use only those branches and leaves which match it reasonably well. These should be cut some little distance away, and no clearing done in the vicinity except to give you the necessary field of fire. Do not build up the walls too high or it will make the hide too conspicuous—besides you may want to stand up and take a shot over the top if the panther proves aggressive or it becomes necessary to give him a second shot. The back I generally leave open to facilitate egress, but if there is any chance of the panther approaching on that side, then it should be built up. When the hide is finished test the loophole and remove any twigs which obstruct your view—then blind it with soft leaves which will not rustle when the rifle is pushed out to shoot, and retain only the smallest possible peephole through which you may watch the goat. Then hammer in the goat's peg (unless a handy root will serve the purpose) and clear up all loose leaves and branches from the vicinity. If the peg shows up white rub it with a little earth. The impression you want to make is that the goat has somehow got a fore-foot entangled in a root and cannot get free. Return not later than 4 p.m. and settle into your hide, taking with you a raincoat, field glasses, waterbottle, and a thick rubber cushion—if likely to be troubled with a cough, take some lozenges too. Load your rifle and place it in a convenient position inside the hide. If the muzzle projects, a glint of sunlight off it may give you away. Then and not till then, have the goats brought up and one tethered to the peg with a thin but stout cord, if necessary doubled. English sash cord is best but seldom obtainable nowadays. It should be tied low down round the goat's fore leg leaving about 12 inches between peg and leg. It is not advisable to tie the rope round the goat's neck as the panther will want to seize it there and may be put off. As your men withdraw with the second goat to a pre-arranged spot about 300 yards away, they should call loudly to the tethered goat, which will almost certainly start bleating at once. If you can arrange for a flock of goats to be driven up and one tied up as they pass, so much the better, but this is seldom possible. The stage is now set and the result will depend very largely on yourself. You must keep as motionless as you possibly can, and only take an occasional peep through the blinded loophole to see that the goat has not broken loose, or in case he shows signs of alarm. Listen for warning sounds from monkeys, peafowl, small birds or squirrels; you may be able to get a shot before the panther rushes the goat. When that happens you will be in no doubt, as the rush is quite unmistakable, but sometimes a panther will work up close enough to seize the goat without much noise. No smoking of course, for reasons already given when dealing with shooting from a machan, which apply with even greater force to a hide on the ground, when the panther may be within a few yards. If for any reason it becomes necessary to change the goat, call up your men by whistle; a panther does not mind that, whereas shouting would definitely alarm him if within hearing, which may be the case. Keep under cover when the men come up, so as not to give the show away either to the goat or to the panther. If the peg draws or the cord

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

breaks when the panther rushes the goat, follow up cautiously and you will probably get a shot before you have gone 50 yards—this has happened to me on two occasions. If a shot from the hide has knocked the panther over, fire again if he shows the least sign of life; an animal which cannot raise its head from the ground is generally finished, but if you have taken the head-shot he may be only stunned, so don't take any chances. If he has rushed away after the shot, as so often happens, wait a little before following up; there will probably be a good blood trail which your men will puzzle out while you keep ready to shoot—your position being of course in front. If the hour is late and the wounded animal has got into a dense thicket, it is far better to leave him till next morning. Locate him by ringing the spot and put a man up a tree or on a rock on the far side, then bombard the place with stones and if this produces no result follow the trail, keeping all together with yourself leading. A good dog is invaluable for this sort of work. Let us hope you will find the panther dead, but if he has sufficient life to charge, a 12-bore with buckshot will prove far handier than a rifle.

Occasionally it happens that after you have settled into your hide the shikari returns with news that the panther has just been seen some little distance away and out of hearing of the goat's call. In such a case it is better to abandon your hide, hurry at once to the new spot with your goat, and take up a fresh position. There will be no time to make a hide. Get behind a good thick bush and lie down flat till you hear the rush, then rise cautiously and take your shot standing—it is an advantage if there is a tree (even a small one) both to rest your rifle against and to give you some cover as you stand up.

How long should one sit up in a hide on the ground? Personally, I come away as soon as it is too dark to see the sights. The loophole has got to be very large indeed to accommodate both rifle and torch, and is almost sure to be spotted, while the same objection applies to an electric lamp fixed outside the hide. You may of course use a 12-bore and buckshot after dark but my experience with this has been unfortunate.

On checking over the above, I find that I have said nothing about clothing. In my experience the best is a green bush-shirt (XIVth Army pattern) with long sleeves which can be rolled down if insects are troublesome, and green trousers or breeches. I am a great believer in shorts for normal shikar purposes, but they are definitely unsuitable for sitting up (either in a machan or a hide), as mosquitoes and ants keep one fidgetting, and immobility becomes impossible. For footwear nothing can beat soft hide boots with crepe-rubber soles. Short ankle putties should connect slacks and boots to prevent ants etc. exploring inside the former. For headwear use a soft hat which will not make a noise brushing against a leaf as a topi does.

Chance-met Panthers

Since panthers are so much more numerous than tigers, one would expect to come across them more frequently by chance, but

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

relatively I have not found this to be the case, to any marked degree. Their smaller size affords them better opportunities of escaping observation, and the way in which a panther can sink down and become almost invisible in grass not 6 inches high has to be seen to be believed. However, in the course of many years wandering in the jungle I have met quite a number, and have extracted from my diaries the more interesting of these episodes.

I was in camp in the Sirpur block of the Raipur district in March 1910, and as I was tying up for tiger, could use only the .22 to secure birds for the pot. On the 24th morning after finding my baits untouched, I went over to a tank close by and with a lucky shot bagged 2 whistling teal. Then, seeing some duck on the far side, I went round to stalk them, and literally walked on top of a fine male panther in the long grass—his tail went up almost in my face. He bolted 50 yards then stood and looked at us, and I was sorely tempted to try a shot at his brain, as I knew the sighting of the little .22 bore rifle to an inch, but there *are* limits, and I thought I should do better to sit up that evening. We found close by the remains of a chital doe killed 2 days before, so I had a machan put up in a tree but the goat refused to call, so nothing came of it.

I had an extraordinary experience with two panthers at Anaikatti on 6th May 1937. I had left the forest bungalow as usual before dawn making for a big rock about a mile distant across the river, which overlooks a favourite wild dog run. The Onion Rock, as it is called, is only about 8 feet high on the uphill side, and as we approached it in the faint light I could just make out a panther spread-eagled on the sloping side of the rock with tail up and head down, very like a mounted skin on the wall. It was only a few yards distant and drew our attention by growling at us. As we backed away some yards uphill my shikari Kunmada, whispered that there was a female at the foot of the rock, but hidden by some small boulders between. As soon as I could get a clear shot over the bushes, though my sights were still indistinct, I fired between his shoulders, and both panthers bolted in different directions. There was no blood, but by the bullet mark on the rock were some pieces of fur. How I missed at such close range I cannot to this day imagine but evidently I had. 'All hits are history—all misses mystery' was only too true in this case—but at least it was an unforgettable experience. Obviously I had interrupted a couple mating, and was lucky not to have been charged.

An unusual occurrence at Mudumalai on the 25th April 1940 also deserves mention. I had gone some way down the Benne road before dawn and branched off at the 4th mile while my driver George went on towards Pipagadi, a sure find for jungle sheep and pig. I heard him fire 3 shots, and at 9.30 a.m. he returned and told me that he had come across a panther stalking a chital doe at close range, and had fired at it, breaking both front legs as it crouched on seeing him. It fell over and then rushed into some long grass, and he had 2 more shots of which one certainly hit. I ran the car down to the spot and by working round managed to get a shot in which finished it—an old male with 3 broken teeth

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and very lanky, and with only half a tail. And now comes the interesting part. In addition to the bullet wounds, I found a number of deep gashes, and the man whom G. had left up a tree to watch the spot, said that a boar had come across the wounded animal and had attacked it, charging 3 or 4 times. The panther was too badly hit to retaliate, and only growled in answer to the boar's grunts and onset, and the latter, presumably realising that he was finished then left him. The man up the tree thought it great fun, and never considered that the skin was being spoilt!

One final episode will close this section. In May 1941 I had to run up from Bangalore to Ootacamund to attend a conference, and managed to obtain a few days' leave, which I spent at Anaikatti. On the 21st morning I went about 2 miles towards the east, and took up my position on a spur looking south, across a deep ravine with a parallel ridge opposite. About 7 a.m. a herd of 19 elephants coming from my left passed in front of me, between the far edge of the ravine and the opposite ridge—they were about 300 yards away, and as they moved along feeding, made an interesting spectacle. Among them was a tiny calf which cannot have been more than a few days old, with a cow in attendance on each side. About 7.20 a.m. I suddenly saw a large panther coming at a fast walk along the far edge of the ravine in the opposite direction—he looked pale grey so long as he was end on to the sun, but when he turned half away all his lovely coat showed up. Suddenly he heard the elephants, which were quite close to him but out of sight owing to the slope of the ground. In a bound he was into the shade of a large bush, where he was difficult to pick up even with glasses though less than 300 yards away. He half crouched, then peered round in different directions, and finally went off after the elephants. The trackers said he was after the small calf, but I think it is more likely that he was simply curious about the noise. Anyhow a couple of minutes later he re-appeared, still at a fast walk, and after going some way down the path by which the elephants had come, turned up to his right over the ridge. I knew there were some large rocks projecting from it on the far side, and hoped that he might lie up on one, so after waiting 10 minutes, crossed the ravine and followed him. Topping the ridge, Kunmada who was leading drew back, and then I saw the panther lying on a ledge about 70 yards away—only part of him showed, but from the colour I guessed it to be a bit of the shoulder and the back of his head. A closer approach was impossible so I sat down and fired at the very small target which offered, and saw his tail flick up twice so knew that all was well. By moving a few yards to the right I could make out a patch of black and white stomach fur between the rocks, but he was lying on a ledge 10 feet from the ground, so first we went round by the left to the top of the ridge and from above with difficulty made him out through the branches of an overhanging tree. Access that way proved impossible, and so we had to retrace our steps and climb up from below to get him down—a fine old male with a deep orange coat, but only 6 feet 10½ inches in length, as his tail had lost about 6 inches. The bullet had caught him nicely on the shoulder and was found

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

inside the brain pan. I always remember this episode with satisfaction, as it was my own idea that he would lie up on the rocks—the trackers thought he would pass on. The shot I admit was a lucky one!

Panthers up Trees

In heavy forest, more especially where the grass is long, panthers not infrequently ascend trees, no doubt to locate deer or pigs with a view to stalking them. In the Mudumalai forest more than one has been accounted for in this position, but although I can recall at least four up trees, I have never been able to get a shot—they have been far too quick for me. I remember one occasion in particular—it was during May 1938, when I was on my way back from Doddakatte to Mudumalai. After topping the rise near Karadibetta, we turned down into the big swamp, and shortly after came to a partially burnt area. There was a herd of chital with several stags feeding out in the open, and I was moving towards them under cover of the trees, when a movement caught my eye in a well-leafed sloping teak tree which we were just about to pass. I looked up and saw a fine male panther cautiously descending, the sunlight through the leaves making him look green and brown. There was a quiet concentrated look on his face and he showed no hurry or alarm, but when I took the rifle from my shikari, he jumped down and galloped off, his tucked up hindquarters looking very small for such a big animal. In the open I might have got him, but a few bounds took him into long grass and though I could have got a snap-shot I did not fire, as my experience is that in such cases one generally breaks a hind leg and loses the animal. What may be called a fundamental shot, or a bullet at the base of the skull, will of course in such cases prove fatal, but one cannot be certain of either without a steady aim, and personally I prefer to forego a shot rather than risk losing a wounded animal. I have seen tiger and boar with one leg missing as the result of misplaced bullets. The wounds had healed wonderfully and were nicely rounded off, but how few animals can recover in such cases, compared with those which die a lingering death? Incidently the tree up which I saw this panther was a very low one, and sloped at an angle of about 60° for the first 10 feet and then flattened out still more.

Panthers and Hyenas

The hyena is generally considered to be a cowardly brute, but the fact remains that if one discovers a panther's kill, it will keep the rightful owner off until it has eaten its full. I have known this to happen on a number of occasions at Anaikatti, where hyenas are particularly common, and in not a single instance has the panther made any attempt to assert its rights beyond growling. The reason for this is not clear. Possibly the panther realises the immense strength of a hyena's jaws and fears being maimed in a rough and tumble, but that would imply reasoning as apart from instinct, a subject on which opinions differ. However, the fact remains that so long as the hyena is on the kill, the panther

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

will not come out to it, but will wait till the former leaves. A cartridge thrown at the hyena will sometimes drive it away, as the human scent will make it suspicious, but if that fails, I think the only thing to do is to emulate the panther's patience and wait till the hyena leaves of its own accord. If the hyena is shot, the panther certainly will not approach the kill so long as the carcase is lying there, and any attempt to remove it will almost certainly give the sportsman away.

While on the subject, I see from my Anaikatti diary of 1939, that a fine old boar came one night to a panther's kill (a large cow) and kept two hyenas off while he ate—he certainly suffered from no inferiority complex! He bolted as soon as the light was put on, as pigs invariably do in my experience, and then no less than four hyenas appeared and were at the kill till 5.30 a.m., taking pieces away and then returning for more. Needless to say, the panther did not materialise, but it was an interesting experience.

Stalking Panthers

If one has sat up overnight without success, it sometimes pays to stalk the kill at dawn. Just before the last war a couple of panthers killed a pony at the top of the Sigur ghat, only 300 yards from my bungalow, so I had a hide made in the bushes fringing the road and put a friend in it that evening. It was not a very hopeful place as there was a certain amount of traffic along the road, and the panthers, to reach the kill, had to come some way down the open hillside. A goat tied up near the shola where the panthers were presumably lying up would have offered better chances of success, but the shola in question was a sanctuary and closed to all shooting. As I feared, the panthers did not come before dusk so B. had to give it up. However he came out again next morning before dawn, and advancing very cautiously under cover, found both panthers on the kill; but by the time there was light enough for him to see his sights the panthers had gone. It was bad luck that the spot was so open as otherwise he would certainly have got a shot.

An example of stalking a panther on rocks has already been given, but in my experience this form of shooting is seldom successful. A panther lying down offers an extremely small target, while any attempt to rouse him merely results in his vanishing before a shot can be fired. If one can work round and above him, the shot will be far more likely to kill him outright, but this is seldom possible.

It is always worth while investigating when one hears monkeys cursing in the jungle—it may be at wild dogs, in which case a shot is pretty certain, but more likely a panther is the cause. I must confess that in the latter case I have never got a shot—the panther has always spotted me first—still it's well worth trying. When I was down at Anaikatti in August 1947 a panther hanging round the bungalow gave me an interesting experience but no shot. On the first morning we were on our way back from a long round, when near the Onion Rock I heard a rush about 70 yards

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

away, followed by a throaty growling and the furious barking of about a dozen chital—obviously a panther had tried to seize one but failed. It was open scrub jungle with a lot of small bushes and I hoped for a shot, but in spite of a most cautious approach failed even to see the panther. That evening sambar belling by the river showed that she was still in the vicinity, and next morning I heard monkeys cursing from a tamarind tree in thick lantana. With my shikari Banta I made a very careful stalk but could find nothing, and as the monkeys were now silent thought that the panther had gone. I sat down and had a cigarette and when we moved on a few minutes later the panther rushed away with growls—it had been lying within 20 yards of us all the time. On reaching the bungalow the waterman told me that he had met her that morning on his way to the well and that she was obviously 'expecting'—this no doubt was the cause of her reluctance to move and her previous failure with the chital. Her cubs were born a day later so I was glad that I had not the opportunity of a shot. What lesson is there in this episode? None! It is simply a jungle memory.

Black Panthers

Living as they do in much denser jungle than is favoured by the normal type, black panthers are by nature game killers, and so are seldom shot over a kill. Out of those which I have known to be bagged in the Nilgiris during the past 24 years only one met his fate when returning to a bullock which he had killed near Avalanche, from a dose of buckshot fired from a Badaga hut. This was a very fine old male which many sportsman had tried for over a period of years—14 to my certain knowledge and possibly longer. But as a rule black panthers are met by chance, and since they are so uncommon, luck plays a very large part. The only black panther which I have seen myself was some 8 miles down the Benne road from Mudumalai 2 years ago. As we turned a corner one morning my shikari Masty who was leading suddenly halted and backed, literally speechless with excitement. I peered round a tree and saw a black panther crossing the forest road 160 yards away, so sat down quickly and fired at her shoulder. I thought I knew the sighting of my .318 to an inch, and made allowance for the fact that the cartridges were shooting high—they were pre-war, and incidently I have not even yet (1948) been able to get fresh ones! However the bullet must have gone over, as she turned and sprang into the long grass, and when we examined the spot there was no sign of blood or extended claw-marks. So that was that! My single chance spoilt by faulty ammunition.

But my driver George has been more fortunate. In June 1939 I sent him down to Mudumalai with a friend who was keen but had little experience of shikar. On their first morning C. had a shot at a nice chital stag but missed. The herd went down towards the swamp, so C. followed but could not get another chance as the stag was hidden by the does. Suddenly the deer began to bark and shortly after a cry showed that one had been seized by a feline. Approaching with great caution through the long grass

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

they saw in a small nullah part of a stag and the hindquarters of a black panther on it, only 10 feet away. While they were peering over a fallen tree to get a better view it spotted them and bolted—both fired but missed. A machan was put up and they sat up all night but it never returned, rather naturally, since it had been fired at over the kill. George saw another black panther, a good deal smaller than C.'s the same year down the Benne road while waiting for me—it passed not far from the car and went in the direction which I had taken an hour before, but we did not meet. On another occasion he saw the big male previously mentioned, at the top of the Avalanche pass, but too far for a shot. Finally he shot a female at Avalanche, and since it was a good example of what may be called the luck element in shikar, I will give the details.

We knew that this particular animal was in the habit of lying out on a small cliff at the head of the Avalanche river, where indeed one had been shot some years before, and I spent the first two days watching the spot, but without success. The third morning proved equally fruitless, but while sitting there we heard a tiger roaring far uphill on our left and shortly after caught sight of him moving towards the head of the Lakkidi pass. It was then too late to do anything about it, but in the afternoon I went up the hill hoping to find him on the move again before dusk—my luck was however out. In the meantime I sent George upstream to shoot a hind sambar for the fish hatchery, and he fired at two but missed. Shortly after he topped the low ridge from which I had been spying previously, and saw a black panther about 200 yards away walking across the open between two sholas. He fired and broke its back—a lucky shot, as if the bullet had been an inch higher it would have missed. I must confess that my congratulations were not untinged with envy!

Clouded Panther

Quite a number of skins of the Clouded Leopard (as it is more generally termed) used to be brought into Bhamo by Kachin shikaries in the old days before the 1st World War, and no doubt they are still to be found in the dense forests covering those hills. I was always hoping to come across one, during my jungle outings from Bhamo, but never had the luck to do so. The large irregular markings make the skin an especially handsome trophy—finer in my opinion than that of the black panther. Among a number which I have handled I found two distinct types—one with the background greenish, and the other a dull brown shade.

Conclusion

This series of panther episodes has proved a good deal longer than I had anticipated, in spite of the fact that I have described only those of special interest, or indicative of methods to be adopted in dealing with this cunning animal. The very full details I have given regarding sitting up will, I hope, prove useful to others, more especially to young sportsmen, and save them wasting time and money.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

If I were asked which of my panther memories is most vivid, I should find it hard to answer. The one finished off by lamp light at Raipur?, 'Old Sala' sitting by the dead goat with his ears laid back and scrutinising every bush? The spread-eagle on the Onion Rock? The shot which stopped the blind rush at Ghatkesara? The pair which rushed the goat together? The one so carefully descending the tree at Mudumalai? The one which stalked the elephants and was himself stalked in turn? Besides these there are others which I have not related: the three seen stalking a sambar calf far below from the top of Avalanche hill, while the hind kept them off; and the belated reveller escorted across a grass maidan at Doddakatte in broad daylight by a barking semi-circle of some 60 spotted deer. All these are clear on the screen of memory, but I think I must give pride of place to my first panther, as she came out of the bushes at full stretch after the Bhil, with the arrow swaying in her flank. That is a memory which can never fade.

Which of my panthers has given me most satisfaction? That is easier to answer, because I can honestly say that those which I 'introduced' to friends, have given me more pleasure than all the rest of my own put together.

One final point. I have often wondered why no enterprising zoologist has counted a panther's spots, and created subspecies from the result. Most people know the story of the showman at the circus, who assured the old lady that a panther has 365 spots, 'one for every day of the year', and what his reply was when asked where the spot for leap-year was situated! But seriously, has no one ever tried to count a panther's spots? Here is a problem still awaiting solution!

(To be continued)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON THE GESNERIACEAE OF BOMBAY

BY

H. SANTAPAU, S.J., F.L.S.

Key to the Gesneriaceae of Bombay (after Cooke and others) :

Seeds with a long hair at each end ; epiphytic shrubby plants : ... 1. *Aeschynanthus.*

Seeds not tipped with long hairs ; ground plants :

Inflorescence cymose, axillary or terminal :

Pedicels adnate to the petioles ... 2. *Didymocarpus.*

Pedicels not adnate to the petioles :

Small, erect herbs with leaves nearly as broad as long ; stamens 2 ... 3. *Epithema.*

Small undershrubs with stoutish stem ; leaves oblanceolate, much longer than broad ; stamens 4 perfect ... 4. *Isanthera.*

Inflorescence in elongated racemes :

Stamens 4 ; calyx winged, one wing often much larger than the rest ... 5. *Klugia.*

Stamens 2 ; calyx not at all, or at least not prominently winged, all the wings, when present, being about equal ... 6. *Rhynchoglossum.*

1. AESCHYNANTHUS Jack

The name *Aeschynanthus* was first published by Jack in Trans. Linn. Soc. 14 : 42, t. 2, f. 3, 1823, and is one year later than *Trichosporum* D. Don in Edinburgh Phil. Journ. 7 : 84, 1822. The name *Aeschynanthus*, however, is included in the list of *nomina conservanda* in the 1947 edit. of the Intern. Rules of Botanical Nomenclature.

1. *Aeschynanthus Perrottetii* A. DC. in DC. Prodr. 9 : 261, 1845 ; C. B. Clarke in DC. Monogr. Phan. 5(1) : 25, 1883 ; id. in Hook. f., Fl. Brit. Ind. 4 : 339 1884 ; Dalz. & Gibs., Bomb. Fl., 135 ; Cooke, 2 : 321 ; Gamble, Fl. Madr. 985.
   Aeschynanthus grandiflorus Graham, Cat. 146, 1839 (non Spreng.)
   Trichosporum Perrottetii (A. DC.) O. Kuntze in Rev. Gen. Plant., 1891.

The habit and leaves of this plant are very similar to those of some of the Hoyas of Bombay, for which it might easily be taken. The corolla is long, tubular, somewhat curved, the colour being red or scarlet. The fruit is a long capsule, very similar to the follicles of the Apocynaceae or Asclepiadaceae. Among the plants in Kew Herbarium there is a specimen labelled by Dalzell as '*Hoya pauciflora* R. W.', the identification of which has been corrected by C. B. Clarke to '*Aeschynanthus Perrottetii* A. DC. var. *malabarica* C. B. Clarke'; another specimen, Ritchie 1861, is also labelled as *Hoya*, but here the mistake is easily understandable as the specimen is in fruit and looks remarkably like *Hoya Wightii* Hook. f. The seeds of *Aeschynanthus Perrottetii* are typical, as they are very minute and possess one very long hair at each end.

2. *Aeschynanthus Perrottetii* A. DC. var. *planiculmis* C. B. Clarke in DC. Monogr. Phan. 5(1) : 26, 1883 ; id. in Hook. f., Fl. Brit. Ind. 4 : 340 (*platyculmis*).
   Aeschynanthus planiculmis Gamble, Fl. Madr. 985, 1924.
   Aeschynanthus ceylanica Wight, Icon. t. 1347 (non Gardn.)

Clarke in the original description of this variety, gives the following characters: branches compressed ; leaves densely approximate, broadly lanceolate

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

or elliptic, narrowed at both ends; umbels 2-4-flowered; corolla 35-40 mm. long. Gamble, loc. cit., raised this variety to the rank of a species, and gave as the distinguishing features of the plant its flattened stems and its very broadly ovate leaves. Cooke, p. 322, seems inclined to deny recognition to Clarke's variety, as he explains the flattening of the stems as due to the epiphytic character of the plant.

Among the specimens at Kew, there are a few with very markedly broad leaves, whilst others, said to be the typical species by Clarke, have narrow oblong leaves. Moreover, there seems to be a continuous set of intermediate stages between the broad and the narrow leaved specimens, sometimes both types of leaves appearing on one and the same specimen. In my opinion, there is very little ground for erecting the broad-leaved plants into a variety, much less so for erecting them into a species.

When Clarke first published the name of his variety in 1883, he called it *planiculmis*, and the publication being valid, the name must stand as a legitimate one. In 1884, Fl. Brit. Ind. 4 : 340, the name appeared changed into *platyculmis*; moreover, in Kew Herbarium there are numerous sheets with this amended spelling written in Clarke's own handwriting; this shows that Clarke intended the name to be *platyculmis* and not *planiculmis*. It is quite possible that De Candolle introduced the correction into Clarke's MS before publication in the DC. Monogr. Phan., the hybrid name *platyculmis* being considered offensive to the ears of a good Latin scholar. Be that as it may, the name was actually and validly published as *planiculmis* and this is the spelling that has to be retained.

2. Didymocarpus Wall.

The generic name *Didymocarpus* Wall. in Edinb. Phil. Journ, 1 : 378, 1819 is *nomen conservandum* against *Roettlera* Vahl. Enum., 1 : 87, 1805.

1. *Didymocarpus hamosa* Wall., Cat. no. 788, 1829, *nom. nud.*
   Chirita hamosa (Wall.) R. Br. in Benn. Pl. Jav. Rar. 117, 1840; Clarke. in Comm. et Cyrt. Beng. 110, t. 78, 1874; id. in. DC. Monogr. Phan 5(1) : 128, 1883; id. in Hook. f., Fl. Brit. Ind. 1 : 360, 1884; Cooke 2 : 322.
   Didymocarpus cristata Dalz. in Hook. Kew Journ. Bot. 3 : 225, 1851; Dalz. & Gibs., Bomb. Fl. 134.
   Roettlera hamosa (Wall.) O. Kuntze, Rev. Gen. Pl. 415, 1891; Fritsch in Engler, Pflanzenfam. 4(3b) : 148, 1895.

Wallich published the name of *Didymocarpus hamosa* in his Catalogue or List, but in the absence of a description, the publication was not valid; the plant was first described by R. Brown under the name of *Chirita hamosa*, the name *Didymocarpus hamosa* Wall. being cited as a synonym by Brown, the date 1840 must therefore be considered as the earliest date for the valid publication of *Chirita hamosa* as well as *Didymocarpus hamosa*.

When this plant is in its vegetatives stages, i.e., in full foliage, it is very similar to *Klugia notoniana* or *Rhynchoglossum obliquum*, its leaves are very oblique, and of about the same size as those of the two plants just mentioned. The most typical part of the plant is that the pedicels of the flowers and fruits are adnate to the petiole of the leaves, in the axil of which they are produced. After the decay of the leaves, the plant presents a very strange appearance.

3. Klugia Schlecht.

1. *Klugia notoniana* (Wall.) A. DC. Prodr. 9 : 276, 1845; Wight, Icon. t. 1353, and Illustr. t, 159 bis; Bot. Mag. t., 4620; C. B. Clarke, in DC. Monogr. Phan. 5(1) : 159, 1883; id. in Hook. f., Fl. Brit. Ind. 4 : 366, 1884; Fritsch in Engl. Pflanzenfam. 4(3b) : 155. f. 71, 1895 : Cooke, 2 : 323.
   Wulfenia notoniana Wall., Tent. Fl. Nep. 16, 1826; id. in Cat. 409.
   Rhynchoglossum scabrum Dalz. in Kew Journ. Bot. 2 : 140, 1850.
   Klugia scabra Dalz. and Gibs., Bomb. Fl. 134.
   Klugia notoniana var. *scabra* C. B. Clarke, in Kew Herb.

When this plant is neither in flower nor in fruit, it is not possible to separate it from *Rhynchoglossum obliquum* or its variety *parviflora*. When in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

flower it is quite easy, as its flowers are considerably larger than those of *Rhynchoglossum*; its calyx, moreover, is 5-winged, one of the wings being considerably larger than the rest, at least on many occasions, and even when the wings are equal they are much larger than those of *Rhynchoglossum*.

This seems to be a relatively rare plant in Bombay: it is only towards the south of the Presidency that it becomes tolerably common.

4. RHYNCHOGLOSSUM Blume

1. *Rhynchoglossum obliquum* Blume, Bijdr. 741, 1826; Clarke in DC. Monogr. Phan. 5(1): 161, 1883.
   Rhynchoglossum Blumei DC. Prodr. 9: 274, 1845.
   Wulfenia intermedia Wall. Cat. 408, 1829.
   Loxotis intermedia Benth., Scroph. Ind. 57, 1835.

This is the typical variety, and does not occur in Western India; it is the commoner variety in Burma, Java, Sumatra. This species is very similar in most respects to *Klugia notoniana* A.DC., from which it differs mainly in having only two stamens and a plain, not-winged calyx.

2. *Rhynchoglossum obliquum* Blume, var. *parviflora* C. B. Clarke in DC. Monogr. Phan. 5(1): 163, 1883; id. in Hook. f., Fl. Brit. Ind. 1: 367, 1884; Cooke, 2: 324.
   Rhynchoglossum obliquum DC. Prodr. 9: 274. 1845; Wight, Illustr. t. 159 bis, f. 7; C. B. Clarke, Comm. et Cyrt. Beng., t. 88, 1874 (non Blume).
   Rhynchoglossum zeylanicum Hook. Bot. Mag. t. 4198.
   Rhynchoglossum Rheedei DC. Prodr. 9: 274, 1845.
   Wulfenia obliqua Wall., Tent. Fl. Nep. 45, t. 35, 1826; Id. in Cat. 407, 1829.

This is much the commoner form in Western India; Clarke in DC. Monogr. Phan., loc. cit., states that this plant is found in valleys in subtropical districts almost everywhere, and that it is about the most widely spread among the plants belonging to this family.

This variety differs from the typical variety in having its calyx teeth very acuminate, and the inferior corolla lip narrower than and about twice as long as the superior lip. In general, flowers of the variety are smaller than those of the typical plant. Many of the plants which I have collected in Khandala on the Western Ghauts show the remarkable arrangement of the inflorescence which was mentioned in the case of *Didymocarpus*, that is to say, the inflorescence is adnate to the petioles, and there may be as many as four or five racemes arranged in a row along the petiole of a single leaf.

R. obliquum var. *parviflora* is a very common plant along the Western Ghauts; it is generally found on rocky ground, occasionally on trees or on old walls; the leaves are very thin and hence rather difficult properly to preserve in herbarium specimens, unless special care is taken in the pressing process.

5. EPITHEMA Blume

1. *Epithema carnosum* Benth., Scroph. Ind. 57, 1835; Clarke in DC. Monogr. Phan. 5 (1): 177, 1883.
   Aikina carnosa G. Don. Syst. 4: 665, 1837–1838.
   This is an East Himalayan plant, not found in Western India.

2. *Epithema carnosum* Benth., var. *hispida* C. B. Clarke, in DC. Monogr. Phan. loc. cit. 178; id. in Hook. f., Fl. Brit. Ind. 4: 369, 1884; Cooke, 2: 325.
   Epithema hispidum Wight, MS. in Herb. Kew.
   Epithema pusilla C. B. Clarke MS. in Herb. Kew.
   Epithema zeylanicum Wight, Illustr. 159, f. 3; it. Icon., y. 1354.

This variety, as indicated by the name, differs from the typical plant in having hispid leaves and peduncles. It seems to be a fairly rare plant in Bombay, except in the Southern districts of the Presidency, where it is tolerably common. The variety *pusilla* Clarke appears to be but a young specimen of var. *hispida*.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

6. Isanthera Nees

1. *Isanthera permollis* Nees in Trans. Linn. Soc. 17 : 82, 1834 ; DC. Prodr. 9 : 279, 1845 ; Wight, Icon. t. 1355; Clarke in Hook. f., Fl. Brit. Ind. 4 : 372, 1884: Fritsch in Engl. Pflanzenfam. 4 (3b) : 159, 1895 ; Santapau in Journ. Bomb. Nat. Hist. Soc. 46 : 380, 1946.

For a full description of this plant, see the last reference, where I gave the plant as a new record for the Presidency of Bombay. The shape of the leaves and the habit of the plant is quite distinct from the rest of the Gesneriaceae of Bombay. It seems to be a fairly common plant in Southern India; but as for Bombay, I have only seen the specimens mentioned in my paper in this *Journal*.

References

Bennet, J. J. & R. Brown: *Plantae Javanicae Rariores*, descriptae iconibusque illustratae, quas in insula Java legit . . . T. Horsfield : observationes . . . passim adjecit Robertus Brown 1838–1852

Bentham, G. : *Scrophularineae Indicae.* 1835.

Blume, C. L. : *Bijdragen tot de Flora van Nederlandsch Indie.*, 1825–1826.

Clarke, C. B. : 1. *Commelynaceae et Cyrtandraceae Bengalenses* (paucis aliis ex terris adjacentibus adjectis). 1874.

2. *Cyrtandraceae* (*Gesneracearum tribus*). In DC. Monogr. Phan. 5 (1), 1883.

3. *Gesneraceae* in Hook. f., Fl., Brit. Ind., 4 : 336–375, 1884.

Don, G.: *A General System of Gardening and Botany* . . . 1831–1838.

Fritsch, K. : *Gesneriaceae* in Engl. & Pr., Pflanzenfam. 4 (3b) : 133–185 1895.

Wallich, N.: *Tentamen Florae Nepalensis illustratae* . . . 1824–1826.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE GIR FOREST AND ITS LIONS

BY

M. A. WYNTER-BLYTH, M.A. (Cantab.), F.R.E.S.

(*With a sketch map*)

I

The Gir Forest has been so strictly preserved that for many years it has been a *terra incognita* except to the very few. The only authoritative articles written on it and its lions appeared in the Bombay Natural History Society's *Journal* as long ago as 1909 and 1911, and in these their author, Colonel Fenton, wrote of a period towards the end of the last century. Since then, except for a short article in 1935 based largely on those of Colonel Fenton, no news seems to have escaped from behind the iron curtain, as it were, and the world at large has remained in profound ignorance about the fate of the Gir lions.

In consequence it was with very considerable interest that I undertook, on behalf of the Bombay Natural History Society, to visit the forest and find out all I could about them and their preservation.

The Regional Commissioner, the Administrator, and the Chief Forest Officer were all most co-operative, with the result that I was given every help in the way of transport and accommodation, and *carte blanche* to find out all I could.

My original plan was to cover the whole area in one tour, but six inches of most unseasonable rain fell the night before I was due to leave for the forest and rendered all roads impassable, so that I had to be content to go to Sasan by train and restrict my investigations to that neighbourhood, covering it on foot and by pony. In the end this turned out to my advantage as I had to pay a second visit to the forest in December, during which I explored the Jamwala and Jasadhar divisions very thoroughly by car, and so was able to complete my programme much more fully than I originally had expected.

* * * * *

In days gone by lions inhabited suitable parts of all north and central India, and even until the beginning of the last century were still common in many parts of this area. In 1822 they were yet to be found in considerable numbers near Saharanpur and Ludhiana, and they were also known in northern Rohilkhand and about Moradabad and Rampur. In 1831 a writer stated that they had been very numerous in Harriana until a few years previously, though they were unknown at the time of writing. However, they were recorded up to 1847 in the Sagar and Narbada territory, one was killed at the 80th mile from Allahabad on the Jubbulpore railway in 1866, and they lingered on much later in Gujerat and Central India.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In the 1830's they were by no means scarce on the banks of the Sabarmati river, and round Mount Abu, Ahmedabad and Deesa. It is recorded that they were hunted on horseback in the last locality by British officers in 1832. The method adopted is not known but no doubt it differed from that employed by John Nicholson when hunting tigers near Rawalpindi some years later. Having found his tiger, he would gallop around it in ever decreasing circles until the beast became dizzy and he was able to ride in and finish it with his sword.

The last lion to be killed in Gujerat was shot at Deesa in 1870.

In Central India they existed even later, one being killed in 1873 and one being seen as late as 1884, but the latter was the last record of any lion outside Kathiawar.

In Kathiawar lions were to be found in Dhrangadhra, parts of Jasdan, Chotila and the jungle tract that ran uninterrupted from the eastern Gir through Girnar[1] to the Alech and Barda Hills in the west. Later they disappeared from northern and central Kathiawar and this jungle tract became their solitary home. With the gradual settlement of the country much of the jungle was destroyed and, when the areas mentioned above became separated from one another by cultivation, the lions finally retired to the protection of the Gir Forest, though as late as the end of the last century parties of them would find their way as far afield as the Barda Hills. Even to this day they sometimes turn up in the Girnar.

It is unnecessary to look far for the cause of their extinction in other parts of India because their fearlessness of man and liking for fairly open country has always made them an easy mark for sportsmen and others.

As for the Gir lions themselves, Colonel Fenton, writing about the forest as he knew it towards the end of the last century, painted a gloomy picture of their future. Such was the poaching and uncontrolled shooting of them that he foretold their speedy extinction (the which he did his little bit to bring about by killing four). That this prophesy had nearly been fulfilled was revealed by Mr. Wallinger, the Chief Forest Officer of Junagadh State, in 1913, after a tour of the forest lasting for nearly two months, when he reported that he thought that there were only from six to eight lions left and that there were certainly not more than twenty. Mr. Brooke-Fox, the Chief Engineer of the State, a keen shikari and one who knew the forest well, confirmed Wallinger's opinion.

As these were the considered statements of two responsible persons, it must be assumed that the lions were, at that time, on the very threshold of extinction.

As a result of this report, Mr. Rendall, the then Administrator, put a ban on the shooting of lions in Junagadh State and at the same time urged states adjacent to the Gir to do the same. Baroda State somewhat naïvely undertook to drive back any lions found within their limits!

---

[1] Distinguish between Gir and Girnar. The latter is the mountain behind Junagadh, some 17 miles away from the Gir Forest.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

At a later date, one imagines when the number of lions was thought to have increased, a limited quota (never more than three a year) was shot, and the present rules for their protection were imposed. These rules, in addition to the control on the number shot, *inter alia,* prohibited the shooting of lionesses and cubs, any other form of shooting in the forest without special permission, and shooting from any kind of vehicle.

All this was wonderfully successful and the number of lions increased to a remarkable extent.

A census was held in 1936 with the following results:—

Division		*Lioas*	*Lionesses*	*Cubs*	*Total*
Visavadar	...	19	7	5	31
Sasan	...	22	27	11	60
Talala	...	18	20	24	62
Jamwala	...	46	15	7	68
Jasadhar	...	38	22	6	66
Total	...	143	91	53	287

As this census was based on the counting of fresh pug marks at drinking places, and on the assumption that lions must drink once, but seldom more than once, in the twenty-four hours, it was held at the end of April when the dry weather had reduced the number of drinking places to a minimum. To prevent the counting of any lion more than once the pug marks were measured, length- and cross-ways, and their sex and direction of departure noted. A watch was also kept around the drinking places for two days previous to the count so that the enumerators should have a good knowledge of the tract allotted to them and some idea of what lions were about. Early on the day before the count all old marks were smoothed over, and the fresh ones were reckoned up the following morning.

This census covered some 700 square miles, including the four forest divisions of Sasan, Visavadar, Jamwala and Jasadhar with their environs, together with Talala Mahal, a region of mixed forest and cultivation which the lions inhabit just as freely as the forest itself. Within these areas the enumerators (who numbered 534) worked in batches each under the supervision of a pagi or some other suitable forest employée. The results were handed in for scrutiny and lions that were suspected of having entered the records more than once were eliminated.

At least this was how it was done in theory, and given a sufficient number of persons competent in junglecraft (and the forest seems well able to furnish these) such a census when undertaken conscientiously should produce a tolerably accurate result. But after making careful enquiries I discovered that certain enumerators, and probably supervisors, added non-existent lions to their totals, on the assumption that the more lions there were recorded, the more lion shikar there would be . . . with its attendant opportunities of baksheesh. So that, although I was assured that the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

census was otherwise very carefully carried out, and that the number of lions so added was very small, the result is, to say the least, suspect.

Nevertheless, the census figures, accurate or not, together with the figures given below of lions shot and found dead in the eleven years following the census, are enough to prove that the protection policy had been a wonderful success, especially when it is remembered that a considerable proportion of those beasts which die in the forest will never be found, and some of those that are found will never be reported . . . especially if their skins are in fairly good condition!

1936 to 1947 (inclusive)	*Lions*	*Lionesses*	*Cubs*	*Total*
Shot ...	27	1	0	28
Found dead ...	18	27	4	49
Total ...	45	28	4	77

(It should perhaps be noted that the proportion of lions to lionesses is almost identical in both tables, viz. 1.57 and 1.6 to 1).

* * * * *

Indian and African lions seem to differ little either in habits or appearance nor is there any reason to think that they differ in size. According to the *Journal* the record Indian lion measured 9′ 7″ and the African 10′ 7″, but the Indian figure relates to the end of the last century since which time data have not been generally available. The Junagadh forest authorities have the record of a 10′ 6″ beast, but as they also have the record of a fabulous monster of just under 12 ft., this figure has to be accepted with a certain amount of reserve. However, it must be remembered that the Gir is but a tiny territory when compared with the haunts of the African lion and it would be most unlikely for it to produce any record-breaking animals. Average measurements compare very well with those of African lions.

The Indian lion is a more shaggy creature than the African, with a fuller coat and with a longer tuft of hair at the end of the tail and on the elbow joints, as well as a fuller fringe along the belly. In conjunction with these characteristics the lion's mane is scantier. Occasionally the mane is blackish, or interspersed with darker hairs.

The Gir lion is a gregarious creature and often travels about in parties (though this habit seems now to be less common than heretofore . . . probably because there are less lions) and hunting may be done in concert, some of the group separating a beast from the herd they are attacking and driving it towards the others which are waiting to kill it.

For food they will kill whatever is most easy to come by, and, as they show little fear of man and his dwellings, are in consequence inveterate killers of cattle and buffaloes, which, in fact, as kills of forest game are seldom found, seem to form much the larger part of what they eat. In all probability they were first driven

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to this habit during one of the famine years which reduced the quantity of game in the forest, and the habit, once contracted, has continued even when game has increased. They are also prepared, on the one hand, to kill goats and camels, and, on the other, wild boars. They will not, however, attack a buffalo unless it is separated from the herd.

In the ordinary course of events they like to kill on alternate days, though when more than two or three lions are associated, one kill will not suffice them all and they will have to kill more often. They will not return to a kill the next evening.

Although they avoid human habitations by day they are remarkably fearless of man and will allow his near approach before sauntering off with dignity. They will attack him only under great provocation (though lionesses with cubs are to be avoided!) and man-eaters are unknown.

During the daytime they lie up at some waterhole or in the shade of a tree, especially a banyan, to come out at dusk to haunt the outskirts of a village or nes at the time when the cattle are driven home. Often the male spends much of the night roaring, for they are very noisy animals, especially when mating. The female is more silent. They may also travel a long way at night and can be found sleeping some miles away from where they have killed.

During those seasons when there is plenty of water outside the forest, from July to November, many lions leave the forest for its outskirts and the cultivated country nearby or even further afield. In Kathiawar it is almost universally believed that this is due to the lions' intense dislike of the swarms of mosquitoes that inhabit the forest during the wet weather. Although, after visiting the forest in October, December and January, I have still to see there a single mosquito, I shall nevertheless accept their presence, as the whole tract has a most unenviable reputation for malaria, but that they are in sufficient numbers to drive the lions from the forest I refuse to believe! The truth of the matter is, I think, that it is the nature of lions to wander, but when water becomes scarce outside they naturally return to the forest where they can easily find it throughout the year.

Concrete proof that lions do wander well away from the Gir during the wet season is furnished at the Junagadh zoo by two lionesses, one of which was caught nearby, whilst the other in actual fact encaged herself!

For several successive nights during September of last year (1948) a wild lioness was seen hanging around the cage of an African lion. She used to arrive after dark in a state of considerable excitement and try to enter his cage. At the first signs of dawn she would slip away to lie up in the neighbouring Girnar jungles.

It was decided to capture her. Two African lions, including the one of whom she was enamoured, were placed in two cages so that there was an empty cage between them. The gate of this was left open and a young goat, as an added attraction, was tied up inside it. These cages are very roomy enclosures out in the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

open, each with a den attached in which the animal may lie hidden when it feels like it.

The lioness arrived soon after dark and with little hesitation walked into the middle cage, the gate of which was immediately shut so that she was imprisoned. She, however, was in such a state of excitement that she did not seem to notice this, nor did she pay any attention to the goat until by chance it got in the way of her frantic pacings up and down the side of her African friend's cage. She then, as far as could be seen, gave it a petulant blow that knocked it over but did little physical damage.

At this point a keeper slipped into the cage and rescued the goat. It is sad, but hardly surprising, to relate that the goat died of shock soon afterwards.

The lioness continued her pacings and efforts to reach her lover until daybreak, but as soon as people began to appear she became frenzied with fury and alarm (and perhaps frustrated passion) and hurled herself repeatedly at the bars of her cage until she collapsed in an exhausted state with the front of her head badly damaged.

As the sun rose higher and it became very hot she was urged (with the aid of small pebbles) to enter her den. This she did and the door was shut upon her.

Here she refused to eat for several days, but at the end of forty-eight hours made no objection to the application of boric ointment to her wound at the end of a long stick, and, indeed, afterwards seemed to appreciate it. After a day or two more she commenced to eat the food offered her (liver and kidneys) and soon began to recover.

When I saw her in December she looked fit and appeared to be becoming more or less reconciled to her fate.

Of other local beliefs perhaps the commonest relates to the lions' fear of snakes. These, they say, kill many lions . . . instantaneously, of course . . . and deaths from this cause rank second only to those caused by the digestive troubles of old age due to decayed teeth and the inability to chew bones properly. Put a twist of blackened rope across a path and lions will avoid it like the plague. Lions also avoid long grass for the same reason, but best of all is the story that after making a kill the lion looks at the twitching tail with suspicion, and, because it reminds him of a snake, tears it out by the roots and lays it aside at a safe distance before beginning his meal!

I only saw one snake and that was a green whip, or tree snake, a species hardly likely to kill a lion.

However, to leave fiction for fact, the lioness mates at the age of 2½ to 3 years and usually produces two, less often three, four, or five, cubs at intervals of 18 months to two years. October and November are the chief mating months, presumably because the cubs will be born in January and February, the healthiest time of the year.

According to Prater, the life span of the lion is the same as that of the tiger, some 30 years.

* * * * *

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Gir Forest is a hilly piece of country situated in southern Kathiawar, south-east of Junagadh city and perhaps 17 miles from it at its nearest point.

The Great Trignometrical Survey of 1878 gave its area as 1,200 square miles, but such has been its progressive destruction that it is now reduced to half its former extent, of which about 500 square miles are in Junagadh territory.

Much of the central, southern and western parts of the forest are thick, but on the northern side it quickly degenerates into scrub jungle before giving way to open country.

The eastern Gir is largely covered with a growth of Acacia, although there are thick patches of jungle along the rivers and nalas.

The Junagadh Reserved Forest is divided into four divisions, and the so-called sanctuary block of Devalia. There are also extensive patches of jungle in Talala Mahal, an additional strip in Baroda territory to the north, and about 40 square miles in the Jetpur block, which forms a wedge between the Sasan division and the Devalia sanctuary. This block, as will be seen later, has had at times an unfortunate effect on preservation within the Junagadh Gir.

At the end of the monsoon, the forest which is of what is known as the 'mixed deciduous type', presents a most attractive appearance, as the variety of plants and trees is great and it is then green and luxuriant. During the hot weather, when the trees have shed their leaves, it becomes a desolate wilderness.

The trees are somewhat stunted, possibly because rock is everywhere near to the surface, and the undergrowth is seldom dense so that the grazing of cattle and buffaloes can take place throughout much of the forest. Here and there are open grassy glades, and, near its edges, patches of cultivation. The forest itself is much cut up into nalas with rocky beds, and intersected by low ranges of small hills, the latter often being bare or only covered with a scanty growth of trees.

By far the commonest tree is teak, often disreputable in appearance owing to the depredations of the defoliator. After teak the most noticeable trees are perhaps *Wrightia tinctoria*, flame of the forest (*Butea frondosa*), an ebony (*Diospyros melanoxylon*), laurelwood (*Terminalia tomentosa*), ber (*Zizyphus jujuba*), *Sterculia urens* with its broad paper-white trunk and gnarled spreading branches, the graceful water-loving jambudo (*Eugenia jambolana*), karanj (*Pongamia glabra*), simul or silk-cotton (*Bombax malabaricum*), and a variety of Acacias of which the most numerous are *Acacia arabica* (babool), and *Acacia catechu*, though *Acacia suma*, *Acacia ferruginea, and Acacia leucophlaea* are all plentiful. Less common are *Adina cordifolia*, bael (*Aegle marmelos*), the Indian laburnum (*Cassia fistula*), *Phyllanthus emblica*, and *Bauhinia racemosa*, though none are rare and the last named is most abundant round Sasan. Here and there a pipal or banyan overtops all other trees, the latter, because there are no goats to nibble its pendent aerial rootlets, growing to a fine tree with the main and subsidiary trunks often covering many square yards of ground.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Of shrubs perhaps the twin-leaved *Gymnosporia montana*, *Holarrhena antidysenterica* (a name that must be hard to beat), and *Helicteres isora* are among the commonest, and of climbing plants, of which there are not many, *Acacia pennata*, *Zizyphus oenoplia*, and a plant with palmate leaves that they call the 'water creeper'.

Although in autumn and winter this forest has great charm, at no time can it have any professional attraction for the forester. A long tradition of lack of attention, uncontrolled fires, inefficient felling and harmful lopping of branches has combined to produce a forester's nightmare, a tangled wilderness of twisted, malformed, and mutilated trees.

(Here I must add in parenthesis that the forest is now under the control of an experienced officer.)

As the Gir Forest is the only forest of any extent in Kathiawar it is of considerable importance, not only for its forest products (which after all are of poor quality), charcoal, and firewood, but also for its effects on climate and the water table of the surrounding districts, and, above all, for its excellent grazing lands.

Very large numbers of cattle and buffaloes graze in the forest, and this year, in addition, some 20,000 head from the famine areas have been allowed to enter. Large quantities of fodder are also being exported to other parts of Kathiawar.

Some of the herds are owned by cultivators but the great majority belongs to professional graziers living in the forest villages, or nesses as they are named. These little settlements with their thatched wattle huts, each surrounded by a dense thorn enclosure within which the stock is kept at night, are quiet places and very much part of the forest. Their owners are mostly of the rabari caste, men of fine physique, dark golden-brown skins and dignified features, a race entirely different from any other found in Kathiawar. Like all the forest dwellers they are courteous and hospitable, free with their offers of food and drink. In the warm weather they go naked from the waist upwards and the fact that their bodies are uniformly well covered with flesh bears testimony to the quality of the milk that they consume in vast quantities.

The main products of the nesses are, obviously enough, butter and ghee.

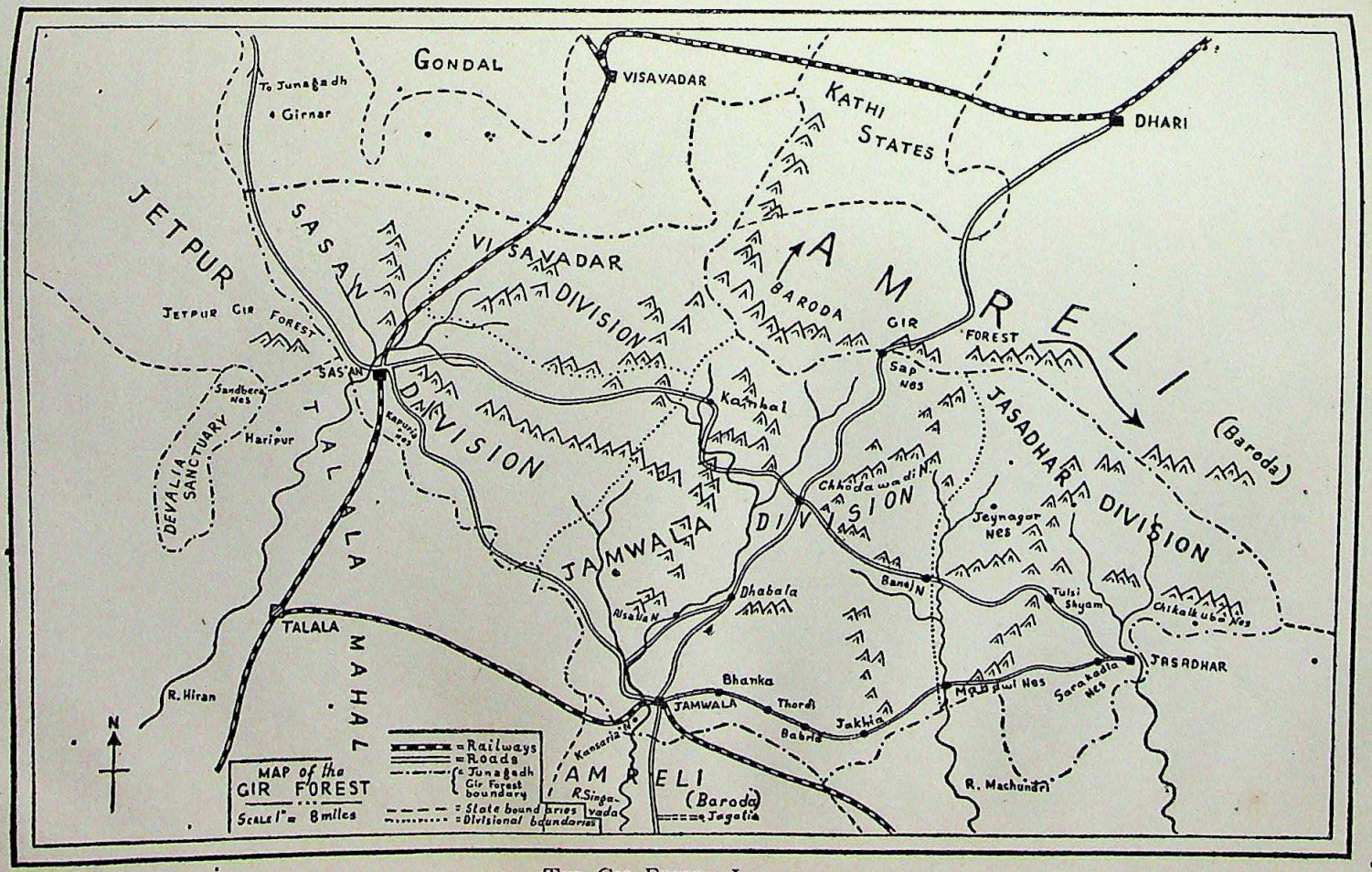
The forester at Sasan, one Sher Mahommed (a remarkable fellow who knew the Latin name of almost every plant and tree in the forest and was a veritable encyclopaedia of their various uses), was my informant about local wild life. As well as lions there were, he said, 'tigers' (panthers), 'jungle sheep' (four-horned antelope)[1] and 'stags' (sambar), but when he told me that there were also 'blue beasts and spotted beasts' I thought for a moment that I had discovered that mythical land of heraldry inhabited by blue boars, red lions, unicorns, white harts, green men and the like after whose fauna so many English inns take their names. But to my chagrin it appeared after all that these were his names for nilgai and chital.[2]

---

[1] Other areas are the 70 square miles of Girnar and an area of poor forest in the Barda Hills.

[2] It should be noted that neither Sterndale nor Prater records chital or four-horned antelope from this part of India.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



THE GIR FOREST, JUNAGADH

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

At the conclusion of my visit to Sasan my impression was that, with the exception of wild pig, game was very scarce in the forest, an opinion I altered after my second visit to the Gir.

Within the forest in Jamwala and Jasadhar divisions wild pig can be found in great numbers, whilst nilgai are abundant. Four-horned antelope, too, are common and chital far from scarce, but sambar seem to be rare. I am told there are plenty of leopards but I saw none, though I heard one and saw pug marks at Sasan. Leopards, however, are very adept at avoiding mankind.

For the rest, we saw several foxes, one or two small parties of langurs, evidence of porcupines, one chinkara (which is only found in the more open easterly parts of the forest) and some mongoose, one of which inhabited the rest-house compound at Jamwala and afforded Sheba many happy hours of innocent amusement. The forest holds no wolves, though these are not scarce in some of the more open and lonely parts of Kathiawar. Two species of wild cat are found, one of a sandy colour (undoubtedly the jungle cat) and one 'with spots', possible the desert cat.

Periodic famines decimate the game. One such disaster took place in 1900 when vast numbers of animals died of thirst and many others in their weakened state were slaughtered by villagers. In 1939 there was another famine which caused a scarcity of game from which the forest only now seems to be recovering. The position has undoubtedly improved, game is on the increase and there are plenty of animals in the forest. The restrictions on fire-arms imposed in 1947 (when the State was taken over) have probably helped in this by limiting poaching by villagers.

I believe K. S. Dharmakumarsinhji of Bhavanagar is producing an article on the birds of the Gir[1], so upon this subject I had best maintain silence, but as regards butterflies, although there was a great abundance of them in October, the number of species was not great (I saw perhaps 43 different kinds) and almost all of them were the commoner varieties. An exception must, however, be made of the skipper, *Coladenia indrani indra*, which I saw on the blossoms of *Acacia leucophlaea*, for this butterfly has never before been recorded as far north as Kathiawar. It was also interesting to see the nymphalid, *Euthalia nais*, so common within the forest as this is the north-western extremity of its range, but not surprising as its foodstuff, an ebony, *Diospyros melanoxylon*, is a common tree in the forest. I also noticed the sword-tail, *Graphium nomius*, a rarity here, and caught a fine series of *Rapala melampus* (the red flash), and one ragged *Spindasis elima* (the scarce shot silverline), both fast-flying strong-blues, on the same blossoms as the skipper mentioned above, probably the foodplant from which *Rapala* had hatched out as I did not see this butterfly at the same flowers elsewhere.

Such then is the Gir Forest, the sole remaining home of the Indian lion.

* * * * *

My visits to the Gir were, to quote my instructions, 'to study

[1] Published Vol. 48 (December 1948), pp. 187-190.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the present condition of the lions with special reference to their rate of decrease or increase and to consider how continued protection could best be afforded without clashing with human interests.'

Because they are the two classes of persons directly interested in the lions, I relied mainly on forest pagis[1] and maldharis (graziers of the forest villages and nesses) for my information. I also collected data about the numbers of cattle and buffaloes killed by lions.

Owing to bad weather my first investigations were confined to the vicinity of Sasan (including the north of Talala Mahal and the Devalia 'Sanctuary'). In this neighbourhood the unanimous opinion was that the number of lions had decreased quite considerably since the time of the census. The losses of cattle were relatively small.

During my second visit I was able to make a thorough survey of the Jasadhar and Jamwala divisions, covering over 300 miles of forest. Throughout the former, and in the southern parts of the latter, it seems that there has been a slight decrease in the numbers of lions since 1936, whilst in the northern and central parts of the Jamwala division, if the reports of maldharis are to be relied upon, there has been an increase. In both these divisions the percentage of cattle and buffaloes killed by lions during the past year was much greater than around Sasan, and greater in Jamwala than Jasadhar.

In short, the number of lions seems to have decreased considerably since 1936 in the west of the forest, and probably to a small extent over most of the remainder.

In view of my suspicions about the accuracy of the census I am not prepared to commit myself as to the present strength of lions in the Gir.[2]

The casual visitor to the forest probably overestimates their abundance, because lions roam a lot and are much given to roaring at night, so that one lion, or a pair, may make its presence felt over a wide area and so be recorded from several different places.

Nevertheless lions are still common and I feel that there is little cause for anxiety over their future if protection is strictly and intelligently enforced.

* * * * *

Almost all lion shikar in the Junagadh Gir has taken place from Sasan. All big shooting parties were centered on the Nawab Saheb's fine bungalow there. In addition, the Jetpur block, which is adjacent to Sasan, has at times been the scene of much shooting of lions (at least 5 lions and 2 lionesses having been shot there in 1947)[3]. This is undoubtedly why the decrease in numbers is greater in the west of the forest and, as lions are animals that

---

[1] i.e. Forest guards.

[2] If compelled to guess the present number of lions in the Junagadh Gir I should say between 125 and 175.

[3] The slaughter in this year, however, was exceptional.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wander a lot, it may well have acted as a drain on the rest of the area.

Lions have also been shot in the neighbouring Kathi States and a few have been killed within Amreli limits. It is probably no exaggeration to say that as soon as a lion passed over the Junagadh boundary someone was after its skin.[1]

But it is only possible to consider shooting as the entire cause of the decrease if there has been more shooting of lions during the last 12 years than in the previous period. This is doubtful, and, if there has not, there must be some contributory cause, for lions were on the increase until about 1936 (or even later).

Cycles of increase and decrease are well known phenomena in nature[2], but their causes are often obscure, though climate sometimes seems to play an important part, either directly or indirectly. Overpopulation too can upset the balance of nature and cause the pendulum to swing in the opposite direction. The Gir lions may be experiencing the downward trend of such a cycle, which shooting will naturally accentuate. But, of course, a fall in the birth rate (or an increase in the rate of natural deaths) may not of itself be sufficient to cause a decrease in numbers, though in conjunction with shooting it may well do so. As there does not yet seem to have been any very serious decrease I think this is the most likely solution.

It is perhaps necessary to add that I have no evidence that there is any poaching of lions in the Gir Forest.

* * * * *

Without any doubt the continued survival of lions in the Gir is due to the protection given them during, and just previous to, H.H. the Nawab Saheb's regime. Similarly, were this protection lifted their speedy extinction could be looked for.

The lion is much bolder, more fearless of man and less cunning than the tiger and so is much more easily shot. This explains the disappearance of this noble animal from all its other Indian haunts whilst the tiger manages to maintain its numbers.

I think it may safely be stated that, as the present Administration of Junagadh is enforcing protection even more strictly than before[3], and as the Saurashtra Government has taken steps to prevent the shooting of lions in its territories adjoining the Gir, they are in no danger of extinction, and, indeed, an increase in numbers may well occur. Their only enemy seems to be man, and if left alone by him, I believe them well able to look after themselves.

But this is not enough, for the number of cattle and buffaloes they kill seems to be very considerable.

The following are answers given to my questions, 'How many cattle and buffaloes have been killed by lions in this nes (or village)

---

[1] A careful policy of afforestation has of recent years attracted lions to Mitiala in Bhavnagar territory to the east of the forest. Here the shooting of lions has been rigidly controlled.

[2] c.f. The Wood White butterfly in England.

[3] Since the Administration took over no lions have been shot. The last lion shot was killed by Brigadier Gurdial Singh at the time of the occupation.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

during the last twelve months? What is the number of your total stock?' While I have no check at all on these figures, nor do I know to what extent they have been influenced by the traditional pessimism of those who take their livelihood from the land, the forest officials who accompanied me believed them to be given in good faith. After a due allowance for the peasant's vagueness about time and numbers, they are probably not a great exaggeration.

		No. killed		Total stock
Sasan Area				
Kapuria Nes	...	6		40
Wadvangada Nes	...	2		8
Nes N. of Sasan		1		120
Sandbera Nes	...	2		250
Haripur Village	...	8		400
Total Loss	...		2·3%	
Jamwala Division				
Janwadala Nes	...	50		1,000
Kansaria Village	...	8		200
Bhanka Village	...	41		800
Chhodawadi Nes	...	50		500
Babria Village	...	20		200
Banej Nes	...	25		125
Sap Nes	...	3		25
Total Loss	...		6·9%	
Jasadhar Division				
Mandwi Nes	...	15		300
Hadal Nes	...	50		1,500
Jeynagar Nes	...	30		600
Chikalkuba Nes	...	25		200
Sarakadia Nes	...	25		500
Anon Nes	...	20		300
Total Loss	...		4·85%	

In fact, as kills of forest game made by lions are seldom found, it is to be suspected that, over a great part of the forest, they rely on cattle and buffaloes for most of their food.

It is fully realised that this is a very serious allegation to make, for it is bound to raise the question of whether it is in the human interest to preserve the lions at all. However, before the very drastic step of removing preservation should even be considered, it is very necessary to collect much more detailed reports than the comparatively meagre information I obtained from some 18 villages and nesses.

It is of the first importance, then, that accurate accounts should be kept of the numbers of cattle and buffaloes killed by lions.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

On the other hand, in defence of the lions as it were, it must be borne in mind that a large proportion of the losses are due to the carelessness of the owners in bringing their cattle home late, in letting single animals wander, and in accidentally leaving them out at night. Also the fact that they receive the benefit of grazing that is free, or for which only a very small fee is charged, on some of the best grazing lands in India, may be considered to some extent as compensation for any loss they may incur.

Any monetary compensation for losses within the forest would, for obvious reasons, defeat its own ends. The increase in the number of old and sick cattle killed by lions would probably be startling! Outside the Gir, which for this purpose should be held to include all areas generally inhabited by lions, compensation might well be considered.

That India possesses the last home of the lion in Asia should be a matter of national pride, and it is hardly for me to assess the price she should be prepared to pay for its survival; but removal of protection and its consequent extinction would certainly create an unfavourable impression abroad.

The aim of the protective policy must be to strike a happy mean which will maintain the stock of lions at a safe level and at the same time endeavour to reduce the losses of cattle.

It is therefore essential to ascertain as accurately as possible by a census the number of lions in the forest.

This in the first instance should be held in April of next year (1950) and subsequently at two yearly intervals.

These censuses and the details of cattle losses will be the essential data upon which to work. From them will be decided whether the shooting of lions is to be prohibited, or the quota to be shot, as well as the areas in which shooting is to take place.

In addition, because it will provide further valuable information, every effort should be made to ensure the reporting of lions that are found dead, together with details of sex, approximate age and, if possible, the cause of death. A record of these should be kept together with that of those which have been shot.

It is probably optimistic to hope to break the maldhari of centuries of habit by persuading him to bring his cattle home earlier and to keep a more careful watch over them, but every endeavour should be made to do so. He is fatalistic over his losses and takes them very much as a matter of course.

At the same time the lions' natural food should not be neglected, for if they are to be discouraged from feeding on cattle there must be an abundance of game for them to fall back upon. It is possible that an increase in the quantity of game in the forest will of itself reduce the losses of cattle by offering increased opportunities there of easy kills . . . as the lions undoubtedly prey on cattle as they are easily come by.

With this in view the forest should be made a sanctuary for all other kinds of game (except leopards) and permission to shoot them should under no circumstances be granted. Leopards, however, should be treated as vermin as they prey on many of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

animals upon which the lions feed (or should feed) and consequently are an unnecessary drain on their food supply.

For the rest, perhaps the prevention of jungle fires is the surest way of preserving the natural life of the forest.

* * * * *

If, because of an increase in the numbers of lions or as a measure to reduce their depredations on cattle, it is essential to take the drastic step of reducing their numbers, this should only be done after very careful consideration and carried out very carefully over a period of years.

If it is considered necessary to shoot lions, permission to shoot should only be granted to responsible persons who are reputed shots on the explicit understanding that they will personally follow up wounded animals. Although no cases of man-eating have as yet been recorded there is no reason why a wounded beast should not adopt this habit. Though lionesses would not ordinarily be shot, there have been instances where a tigress has passed on this habit to her cubs. A lioness might well do the same.

II

Sasan (October)

Accompanied as usual by Sheba, I arrived in Junagadh on September 30th and made all arrangements for a very thorough tour of the Gir Forest by car. Unfortunately the night before I was due to set out it began to rain and a report came through the following morning that already the roads were in bad condition. So our departure was postponed in the hope of an improvement in the weather. After raining steadily all day until evening, the storm greatly increased in intensity, and some of the heaviest rain I can ever remember fell throughout the whole night, accompanied by persistent lightning and violent thunder. As road travel was now out of the question I decided to go to Sasan by train and there make my headquarters with the object of covering as much of that neighbourhood as I could on foot and by pony. If it could be arranged I should pay the forest a second visit in December to complete my investigations.

As it turned out the weather did me a good turn for the roads had not been repaired after the monsoon and were already impassable before this storm.

Although this limited the scope of my activities, it greatly added to my comfort, for the Sasan bungalow is the Nawab Saheb's old shooting lodge, a large and most comfortably furnished house. As the State had kept on all the old mehmandari arrangements I spent a week in luxury.

The bungalow is situated amidst pleasing surroundings in a grassy park with jungle and hills surrounding it on three sides. Though perhaps it does not possess quite the same remote charm as Jamwala, my headquarters when I returned in December, it is a delightful enough place. The bungalow itself is remarkable for the two giant beds which were installed for the visit of a certain very large Viceroy and Vicereine, and for the phenomenal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

number of lizards that have their habitation there . . . much to Sheba's joy, for lizard shikar ranks high in her list of blood sports.

My routine here was very peaceful. At daybreak I was woken by the persistent call of a brain-fever bird somewhere in the depths of the jungle, and soon after sunrise I would walk or ride to a neighbouring village or nes where I questioned the inhabitants and so, bit by bit, amassed a fair amount of useful information. After lunch I dozed and in the evening the morning's programme was repeated. When I returned I would sit peacefully in front of the bungalow sipping cherry whisky (which, together with Eritrean beer, were the extremely improbable, but nevertheless most acceptable, drinks supplied to me by the State!) listening to the evening chatter of the mynahs and paroquets or watching the play of light on the wonderful bank of clouds that built itself up to the north on three successive evenings. When the pink of the clouds had changed to a toneless grey I would move inside and write up my notes for the day.

Although in my wanderings I went as far afield as the Devalia Sanctuary (a misnomer as the area is in reality a reserve for lion shikar) and saw much of the forest, I came across no game except wild pig, and saw no lions. There is, however, plenty of evidence that there are lions about at other seasons of the year (though in no great numbers) but it appears that most of them leave this part of the forest for its outskirts during the monsoon and just after it.

This visit to Sasan was valuable as a preliminary survey but insufficient to give me an impression of the whole forest.

Fortunately I had no difficulty in fixing up a second visit in December.

* * * * *

Jamwala (December-January)

Accompanied on this occasion by my wife as well as Sheba, we arrived in Junagadh on Christmas Eve and spent that afternoon arranging details of our trip, devoting the following day to sight-seeing. Junagadh is a most attractive town and its pleasant surroundings are a remarkable contrast to the rest of Kathiawar.

Early on the 26th we set off to motor the 60 miles to Jamwala. Our journey was without incident except at one point where the road was blocked by a fallen tree and we had to make a detour through the forest, an operation that entailed the felling of several large saplings. At Sasan we picked up Mr. Sheikh, the A.F.O. at Jamwala, who was to look after us, and arrived at Jamwala in time for a late lunch.

Jamwala is on the southern edge of the Gir on the banks of the Singavada river, the rest-house being situated to the north of the village on a small hillock that gives a view over fields to the forest. To the left lies the river, a pleasant stream of no great size that runs between banks thickly clothed with karanj[1] and jambudo[2], the latter a graceful, water-loving tree that resembles

[1] *Pongamia glabra.* [2] *Eugenia jambolana.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the willow. Beyond the river are the white buildings of the divisional headquarters and behind them small jungle-covered hills. It is a tranquil place, and remarkable for its greenness even at that time of year when most of Kathiawar, because of the failure of the rains, was already half desert.

The same evening we began our investigations by driving out to Alsalia Nes, 8 miles into the forest, learning at the same time what the forest roads were really like, for although the road by which we had come from Junagadh was tolerable, the remainder are bad beyond description. It was only the remarkable skill of our driver that saved us from disaster on many an occasion.

Owing to the suspicious character of the rabari headman of Alsalia our investigations were fruitless. He was convinced that we wished to seize one of his buffaloes and tie it up as bait for a lion. Such things, he said, had happened in the past. He had no idea how many buffaloes he possessed, no lion had ever killed any of them, and furthermore he had not seen any lions for a very, very long time!

He was a fat, bouncing little man with a remarkable red, white and black plaster attached to his stomach. It was, he told us, made of red chillies and the sticky white sap of umbro[1], and was an infallible cure for tummy-ache. The third ingredient, one assumed, was grime collected during manufacture. As Mr. Sheikh aptly remarked, it was an undoubted example of jungly antiphlogistine. However, our rabari acquaintance's suspicions did not cause him to neglect the courtesies of the forest and he made the customary offer of milk. Indeed he seemed very hurt when we refused it on the plea that it was growing very late.

Whenever one halts at a forest village or nes this offer of tea or milk (and sometimes food) is made, and, because they are a genuinely hospitable people, refusal is taken as discourtesy. As one is expected to stop at every habitation this makes progress a little difficult.

Both tea and milk are served in a cup, but it is etiquette to pour them into the saucer and drink from that. Tea is sometimes infused with ginger or cinnamon, both of which strange mixtures are quite pleasant on a cold morning.

My wife heard lions roaring throughout the night: I was far too soundly asleep to hear anything.

* * * * *

Having failed at Sasan, it was essential to see at least one lion at Jamwala, if only as direct evidence that the Gir lions were not an elaborate myth! On this occasion Mr. Sheikh was successful beyond all expectations and showed us four within 72 hours of our arrival.

On the evening of the second day we bumped our way eastwards in search of news along the track that runs to Jasadhar. Four lions had been heard near Thordi, six miles away, and two had been seen at Bhanka, a couple of miles nearer home. As these

[1] *Ficus glomerata*, a species of fig tree.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

two lions had walked into Bhanka village the previous night we decided that this was the best place to tie up a young buffalo.

At 4.45 a.m. we were woken by Mr. Sheikh with the news that a pair of lions had killed shortly after two o'clock. Hastily driving to Bhanka, we halted on the near side of the village and made our way as silently as possible through its tortuous ways to come out on the far side behind a broken wall. From here, at about 80 yards distance, we caught two dusty shapes in the light of our torches before they slunk off into cover. As our view of these lions had been indistinct we decided to bring the car round in the hope of picking them up in the headlights. So we beat a retreat by the way we had come and returned with the car. Then fortune favoured us, for we immediately discovered the lions close to our left, and instead of making off in that direction they came out into the road directly in front of the car. The next fifteen seconds were fraught with excitement, for although the lion almost immediately bounded off to the right and disappeared, the lioness shambled straight down the road with us wildly accelerating behind her in mad pursuit. So close were we at one time that I thought we should run her down. Then she too, tiring of this irritating game, bounded off into the bushes after her mate. The driver showed every sign of making the car do the same and it was only with the greatest difficulty that I restrained him and persuaded him to turn back and make for the village.

Leaving instructions with the villagers to follow up the lions as soon as day broke to find out where they were lying up, we drove to the range headquarters at Dhabala to tell the forest pagis to do the same.

Here we were glad enough to drink tea and warm ourselves at a large wood fire. As soon as dawn began to make its appearance we set off for home.

Owing to the villagers' late start (much time was spent in gossiping and drinking tea) the tracks were lost and so was our chance of seeing the lions by day.

The following night a cow was killed at Jamwala, and fresh pug marks found by an ex-pagi named Kaloo Mahommed, and followed until he discovered a pair of lions lying up on a hilltop between Bhanka and Jamwala. As they were out in the open, just over the brow of the hill, it was planned that we should approach from the far side, walk up as near as possible and hope for a close photograph of them. This sounded alarming, especially as the suggestion came from the Settlement Officer, Mr. Nur Mahommed Balooch, a charming fellow, but one who had already struck us as being of a singularly reckless nature! I also remembered the story of a rabari, who, to demonstrate the harmless nature of lions, rushed up to one brandishing a stick and shouting . . . and was promptly killed.

So once more we returned to Bhanka, and, after walking perhaps two miles to the low, scrub-covered hill upon the top of which the lions had been seen, we were met with the news that they had moved into a nala close by and were now sleeping in thick shade that would make photography difficult. Therefore

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

plans had to be changed and it was decided (much to the Settlement Officer's disappointment) to place a machan at the top end of the nala, tie up a goat close by, and gently drive the lions up the nala in the hope of a photograph of them killing the goat.

While the goat was being brought from the village we relaxed in the cool shade of a babool tree. It was very peaceful and Mr. Sheik and the Settlement Officer told us comforting stories to show the magnanimity and harmless nature of lions.

At last the goat arrived, but, when all was ready, it was found that the Settlement Officer had obstinately reverted to his original plan and insisted that we first try to photograph the animals on foot, and then, if they had not been too much disturbed, take up our position in the machan. Accordingly we set off in the following order. First came two pagis as vanguard, one to the right and one to the left, each armed with an ancient muzzle-loader charged with a large but far from spherical ball. Between the pagis, but a little to the rear, came myself, somewhat apprehensive and with camera ready for use, followed closely by the Settlement Officer, another armed pagi, and my wife, whom I knew, by the look on her face, to be remembering Rajkot Cemetery where are already interred two English officers killed by lions (as well as two College Principals' wives who had met a less violent death). Behind her came Mr. Sheikh, then the village patel, and finally two more armed pagis. If it is added that most of the pagis were of Baluchi descent and wore beards of formidable aspect it will be appreciated that our little company presented an unusual spectacle.

Proceeding thus, we crossed the open hill-side and made a stealthy, but far from silent, descent into the nala, picking up on the way the ex-pagi, Kaloo, who had been keeping a watch on the lions from the top of a tree. The lions had moved once more and were now out of sight. So we advanced carefully up the nala for perhaps one hundred yards, seeing nothing, until, at perhaps twenty paces directly in front, the lion rose from where he had been lying in the shade of a small tree. For the next fifteen seconds I was too fully occupied in trying to take the photograph to register accurately either the exact appearance of the lion or what was going on around me. But as far as I can recollect, just as I raised my camera, I was very firmly grasped and propelled forward by the Settlement Officer who apparently thought that honour would only be satisfied with a close up of the beast's head, while a few yards behind me my wife received the same cavalier treatment from Mr. Sheikh. When I had steadied myself and released the shutter of the camera, the lion had already given us a look of pained surprise and begun to make off at a leisurely pace into the vegetation on the other side of the tree. At the same time the lioness, who had been lying up till now concealed in the grass close to the lion, rose up and trotted off to the right. This was a signal for the outbreak of the strangest cries from our company, some bleating like sheep, and others making the most curious popping noises with fingers and mouths. I then found myself running rapidly after the lioness in the company of the Settlement Officer and the two pagis, with the result that I got a very close

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

photograph of her just *after* (as it turned out) she had disappeared into a thicket.

Although I had often contemplated the unpleasant circumstance of being pursued by some large beast of prey, never in my wildest dreams had I expected to be involved in the reverse of this situation.

When the lioness came into sight once more, we watched her make her way up the hillside facing us, stopping every now and then to look for her mate. When she had disappeared over the brow of the hill, we remembered the lion and made a wild rush, to the accompaniment of the aforesaid strange noises, to a point of vantage from which we could overlook the head of the nala. As we did so he broke cover and ambled across the open hill-side, perhaps sixty yards away, the very embodiment of dignity and grace. He was a magnificent beast with a dusky mane, and I was struck, as I had been struck when I first saw a tiger in the jungle, by his apparently immense size and the sense of his tremendous power.

The whole party was highly delighted at the success of these manoeuvres. It was, they declared (and I can well believe it), the first time that a lion had been photographed by this method, but, the jemadar-pagi added wistfully, if only we had been quiet we should have got *much* closer.

It is sad to have to admit that the photograph was hardly a success, for at the moment of taking it the lion had already concealed himself so effectively among the leaves of the bushes that, though his head is visible, it requires some considerable exercise of the imagination to make it out.

* * * * *

Having both seen and photographed lions, we were now free to explore the forest. Accordingly, early the next morning, we set out for Jasadhar. This was in the nature of a pioneer expedition for it is doubtful if any sane person has ever attempted to take a car so far over such bad roads. However, we accomplished it with little damage to ourselves apart from a few bruises, and to the car apart from a bent steering rod.

We followed the road that leads northwards into the middle of the forest and there turned east, stopping for a short spell at Banej Nes to examine the old antimony diggings and to drink tea flavoured with ginger.

Ten miles further on, after crossing a small range of hills over which the road was more appalling than usual, we dropped down to Tulsi Shyam where Krishna's ancient temple stands in an attractive jungle setting.

As a place of pilgrimage it is of some considerable importance, as may be seen from the size of the dharamsala attached to it, for it caters both for spiritual comfort and bodily relief, being placed at the site of a hot spring. Its waters are led into a commodious tank for the use of the pilgrims and the fact that they are hot enough to make the act of bathing a penance is quite in keeping with the spiritual nature of the place.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The priest, a most hospitable soul, received us very warmly and having shown us round the temple, entertained us to an excellent lunch. Then having presented Sheba with a luddu the size of an orange (which she devoured at a gulp and so gained great local izzat) he set us on our way with many requests that we return for a long stay.

Beyond Tulsi Shyam the jungle turned to thick Acacia scrub, and, being less cut up by rocky nalas, progress was more rapid. Even so we did not arrive at Jasadhar until well after 1.00 p.m., the whole journey having taken us some five hours. As Mr. Sheikh had promised, we found Jasadhar a 'quiet' place; indeed few places can be more remote and isolated. So difficult is it to approach that one does not imagine that the A.F.O. stationed there is much troubled by interference from his superiors, an advantage which a recent A.F.O. apparently appreciated, as the story of the haunted bungalow goes to show. .

This bungalow is the A.F.O's quarters, and we had been told about it in Junagadh though nobody was able to give us details of the haunting. Consequently it was disappointing to find out, on arrival at Jasadhar, that the ghost was a 'propaganda' ghost. . . that is, merely a rumour spread by the previous A.F.O. to prevent anyone displacing him.

Panthers abound round here and Sheba had to have an armed guard when I took her for a stroll in the jungle.

Our return, which was along the southern edge of the forest, was not quite so uncomfortable, as stretches of the road had been repaired. It was dark long before our return to Jamwala.

The following day was devoted to a well-earned rest.

* * * * *

The six days that were left to us were spent pleasantly in making long or short expeditions into the forest and the country round about. Of long trips there were two, of which the most ambitious took us to Dhari, the military headquarters of Amreli, for the purpose of carrying out very necessary repairs to the damaged steering rod. Our way led across the forest to Sap Nes and through the narrow strip of the Baroda Gir. This tract is good thick forest which undoubtedly contains lions (there were, so we were told, plenty round Sap Nes, and this was within the central forest area where they seem to have increased their numbers of recent years), but whether any would be recorded from here during a census is doubtful as this northern side of the hills is dry and would probably hold few drinking places in April.

At Dhari, which is a neat little cantonment set in the middle of a desert wilderness, we inflicted ourselves unheralded on Mr. Sheikh's uncle, the colonel commanding the station. He rose nobly to the occasion and gave us lunch and tea.

Our second long expedition took us to Kankai, an unimpressive little temple which is nonetheless the religious centre of the Gir. Our way as usual led through Chhodawadi Nes, which may well be termed the Charing Cross of the forest, and thence westwards through abrupt little hills covered with thicker jungle than we

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

had seen before. Much of the grass was very long as we were passing through a reserved area where no grazing was allowed, and many of the trees showed signs of bad damage from fire, the scourge of this forest. There was plenty of game about and we saw large numbers of pig and nilgai, all very tame for there is little to disturb them.

At Kankai we found the priest away, but his chela, a venerable old gentleman with a flowing beard, took charge of us and, having shown us the temple of the goddess Kankai, led us down to the river to point out to us a green tree snake (*Dryophis mycterizans*) that was wound in and out among the branches of a leafless bush on the other side. It was a wonderful example of natural protection for it was so like a long ribbon of weed that I was not convinced it was a snake until it was caused unwillingly to move by a stone that landed close by.

When we halted at Chhodawadi on our return, Sheba, who had already performed prodigious gastronomic feats at this nes, finally gained undying fame by drinking five pounds of buffalo milk: she also met her Waterloo, for she could no more.

Two other trips, neither of which could really be considered to be in connection with lion preservation as they were into Amreli territory, well south of Jamwala and the forest, were to Mul-Dwarka and Jagatia.

Mul-Dwarka is a very ancient temple intimately connected with the Lord Krishna's sojourn in these parts. What is left of it, which is little enough as the building is in a state of almost complete decay, is situated on a small promontary, jutting out into the Arabian Sea close to the quaint old walled town of Kodinad. There is a small fishing village nearby whose main catch is a species of small hammer-headed shark.

When we left Mul-Dwarka just before dusk, the harsh but melodious *Kronk*! *Kronk*! of kūnj (demoiselle crane) was to be heard as a flight of these birds came into the fields nearby.

One of my pleasantest recollections of Kathiawar will always be of the wonderful formations of these birds that wing their way overhead at daybreak and shortly before dusk to the sound of this peculiarly attractive note. Their mastery of the art of formation flying far exceeds that of any other bird I have seen and it is always a joy for me to watch them. The variety of their formations is endless, but they always fly in echelon with each bird avoiding the slip-stream of the bird in front, and rapidly change from one formation to another with practised skill. Sometimes, especially with flights that take place during the daytime, these formations break up and the birds circle round and round with much tumult in an untidy irregular mass, presently to resume formation, fly on for a stretch, and then repeat the performance.

Jagatia, not far from Jamwala, is remarkable for natural gas! In a field close to the small village six large iron pipes emerge from the ground, tapping the reservoir of gas some two hundred feet below the surface. As the pipes have been in position for several years some millions of cubic feet of valuable gas must have been uselessly dissipated into the surrounding atmosphere, for the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

supply has been put to no use at all, except by the occasional villager for cooking his dinner.

The gas smells of sulphur, is easily ignited and burns with a clear smokeless flame.

On the 6th of January we reluctantly returned to Junagadh, and the following day made our dusty way to Rajkot.

* * * * *

When other memories of our visit to the Gir fade, one which will always remain is that of the hospitality we received from Mr. Sheikh, who told us that he considered us his honoured guests, from his uncle, from the priest at Tulsi Shyam, from everyone down to the humble maldharis of the forest.

This part of Kathiawar has retained much of the old courtesy that so many parts of India have lost long since.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON BIRDS OF THE IRRIGATED AREA OF SHWEBO DISTRICT, BURMA

BY

W. L. ROSEVEARE, I.S.E. (Retd.)

(*With a sketch map*)

INTRODUCTION

Except where otherwise stated, these notes cover observations made between October 1930 and March 1934 in that portion of the Shwebo district irrigated by the government canal systems. The trivial names used are those adopted in *Birds of Burma* by Smythies.

GLOSSARY OF BURMESE WORDS USED

Chaung—A stream-bed that goes dry, or practically so, for part of the year.
In—A shallow natural lake.
Indaing—Dry forest without bamboos.
Kaing—Land in a river bed, exposed and often cultivated in the dry weather.
Kazin—The low bank surrounding a rice-field.
Kokkobin—*Albizzia lebbek*. A large common roadside tree.
Mayin—A rice crop grown during the dry weather, and therefore practically restricted to the borders of *ins*.
Nyaungbin—The pipal tree.
Tanaungbin—A tree of moderate size.
Taze—A large area, adjacent to the Irrawaddy, in the Minbu district, which is covered only by very high floods.
Ya—Dry (i.e. unirrigated) cultivation, other than *kaing* (q.v.).

ABBREVIATION

I.B.—Inspection bungalow.

LIST OF SPECIES

Corvus macrorhynchos. The Jungle Crow.

Habits.—Frequently seen in company with House Crows; generally solitary in pairs, but occasionally in flocks.
Status.—Fairly common; observed in every month.

Corvus splendens. The House Crow.

Habits and Food.—A pair once observed wading in shallow water and picking food off the surface. Sometimes seen feeding on young buds of *nyaungbin*.
Nest and Eggs.—One nest observed under construction as late as 10 June, but was never finished. Nests seen occasionally in same tree as those of Pond Herons and Little Egrets.
Status.—Very common every month.

Urocissa erythrorhyncha. The Red-billed Blue Magpie.

Status.—Occasional cold weather visitor to the area. Earliest date 29 October.

Dendrocitta vagabunda. The Tree Pie.

Habits and Food.—Usually seen singly, occasionally in pairs; frequently in cotton trees, mangoes and tamarinds.
Status.—Uncommon, especially in hot weather and rains. Not seen between March and 4 August.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Crypsirhina cucullata. The Hooded Racquet-tailed Magpie.

Voice.—Twice seen uttering harsh raucous call.

Habits.—Generally seen singly, but family parties observed between July and October.

Status.—Seen in all months except May and June. Latest date 29 April, earliest 18 July. Never common.

Argya gularis. The White-throated Babbler.

Voice.—I once saw it uttering a *cheep cheep* call, followed by a trill.

Nest and Eggs.—Fledgling handled as late as 16 September.

Status.—Common in every month.

Timalia pileata. The Red-capped Babbler.

Identification.—Deep red crown and pure white forehead are conspicuous in the field; otherwise very similar, both in appearance and movements, to the Yellow-eyed Babbler.

Habits and Food.—Bird seen on 29 April was among bushes at least a mile from any moisture.

Nest and Eggs.—The same bird was behaving as though near its nest, but I failed to find it.

Status.—Very uncommon, only two observations, 29 April and 22 August.

Chrysomma sinensis. The Yellow-eyed Babbler.

Voice.—A harsh chattering call, rather like a Burmese Shrike's or Blanford's Bulbul's, but much softer. Occasionally utters a beautiful song, something like a Magpie-Robin's, from top of tree or bush. Bird seen singing as late as 16 October.

Habits and Food.—Generally seen in dry scrub jungle, but also in wet rice-fields and swamps. On one occasion, 16 December, at least 6 birds emerged from cracks in dry mud at the edge of Wetlet Lake when I had almost trodden on them.

Nest and Eggs.—Bold when nesting. One bird brought material to nest when I was within 6 yards and plainly visible. The beautiful cobweb framework had been completed and a start was being made in adding grass blades to it. Nest building observed on 13 September (latest date), and in another case young just able to fly observed on 30 September.

Status.—Fairly common in hot weather and rains, less so in cold weather.

Ægithina tiphia. The Common Iora.

Voice.—One phrase may be represented by the words *Oh, here we are.* The plaintive call *we-e-e-tu*, stated by Stuart-Baker[1] to be uttered only in the rains, was heard as early as 12 February and as late as 7 November. The *we-e-e* is sometimes repeated many times without the final lower note. A male was once seen singing cheerfully on 2 August, although moulting and very bedraggled. On the same day of the year, in Mandalay district, I once saw a female uttering a loud trisyllabic note while sitting on her nest.

Nest and Eggs.—Male with all-black crown of breeding plumage once observed on 13 February. Partial breeding plumage seen on 20 September (latest date).

Status.—Observed in all months, but not so commonly during the rains.

Habits.—Occasionally seen catching insects on the wing.

Chloropsis aurifrons The Gold-fronted Chloropsis.

Habits and Food.—Whenever observed, it was feeding in trees in bungalow compounds.

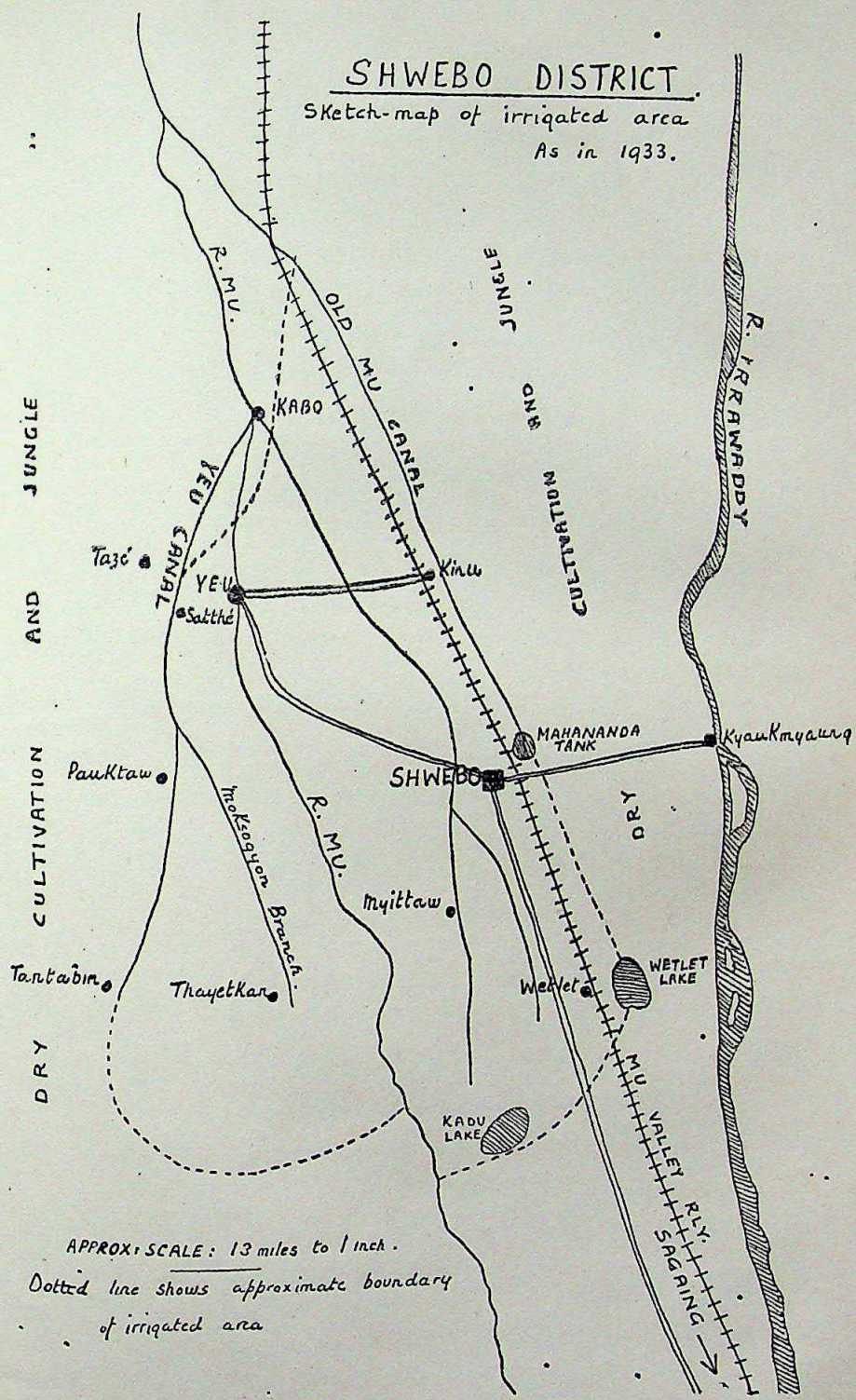
Status.—Very uncommon, and only seen between 23 September and 26 January.

---

[1] *Fauna of British India* (Birds).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Molpastes cafer. The Red-vented Bulbul.

Status.—Fairly common, observed in every month.

Pycnonotus blanfordi. Blanford's Olive Bulbul.

Voice.—Usually an ugly grating call, but I have seen it uttering quite a musical trill.

Nest and Eggs.—Nest very loosely woven. Sometimes found entirely suspended, sometimes supported from below as well. Found in creeper on house porch, in small cutch tree, in thorn bush and in pile of dead brushwood. Fledgling seen 4 April (earliest), eggs found 21 June (latest).

Status.—Very common in every month.

Saxicola caprata. The Stone-chat.

Voice.—A male was once seen uttering a pretty song of 6 syllables, followed by the ordinary *tsak-tsak* call.

Habits and Food.—Frequently seen perched on rushes in Mahananda tank and Wetlet Lake, and on one occasion in September a number were seen on growing paddy. Once observed on top of toddy palm and once on roof of bungalow.

Status.—Observed in all months except March, but scarce in April and not common in May.

Saxicola torquata. The Japanese Bush-chat.

Habits and Food.—Seen more than once perched on bushes etc. growing in water.

Status.—Observed between 22 August and 16 May, but never common.

Luscinia svecica. The Red-spotted Bluethroat.

Identification.—White eyebrows and chestnut patch on throat were usually conspicuous.

Habits and Food.—Seen on paddy field *kazin*, in scrub jungle, and on abandoned canal bank. One stood very erect, but ran with body bent forward and tail uplifted.

Status.—Very uncommon; only observed three times.

Calliope calliope. The Common Rubythroat.

Habits and Food.—Once seen feeding like a wagtail, running very fast in short rushes, with head lowered, usually ending by catching an insect.

Status.—Very uncommon; only observed three times; latest date 16 April.

Copsychus saularis. The Indian Magpie-Robin.

Voice.—In the cold weather I frequently heard it utter a long loud rather plaintive whistle. The earliest date I heard its song was 27 February.

Nest and Eggs.—Fledgling, just able to fly, observed on 7 August.

Status.—Observed in every month, but very seldom in October.

Monticola solitaria. The Blue Rock-Thrush.

Voice.—On two occasions I saw it uttering a harsh grating cry, something like a roller's, whilst vigorously bobbing its head low and its tail high.

Habits and Food.—It was fond of the Shwebo golf-course and the Kabo headworks. Its food includes caterpillars.

Status.—Fairly common in the cold weather. Earliest observation 30 September, latest 3 April.

Siphia parva. The Red-breasted Flycatcher.

Identification.—Red on breast only once observed, and then only a very pale rufous tinge, visible only intermittently.

Voice.—The loud harsh chirp has reminded me of a cricket, and also of a Streaked Fantail Warbler's note, though more continuous.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Habits and Food.—I once saw a number hawking flies from perches on clods of earth at the edge of a tank.

Status and Distribution.—Fairly common in cold weather. Earliest date 15 September, latest 14 February.

Eumyias thalassina. The Verditer Flycatcher.

Voice.—The only specimen observed in the area (on 13 January 1934) was uttering a chat-like call, whilst perched in a mango tree.

Status.—Only once observed in the area, on 13 January 1934, at the head of Distributory No. 1 of the Moksogyon Branch Canal.

Culicicapa ceylonensis. The Grey-headed Flycatcher.

Habits.—On two occasions, both in November, I observed one hawking insects from the top of a tall pipal tree in Pauktaw inspection bungalow compound, on the bank of the Yeu canal. On a third occasion, in February, I saw one fly down from a mangoe tree to the surface of a canal and back like a flash. The continual fanning of the tail is a conspicuous habit.

Status.—The above observations were the only ones in the area.

Tchitrea paradisi. The Paradise Flycatcher.

Status.—Observed twice only in the area, on 8 April and 22 July. A third observation was made at Kyaukmyaung on the Irrawaddy, a short way outside the area, where on 23 April two full-plumaged adult males and one female were seen together.

Hypothymis azurea. The Indian Black-naped Flycatcher.

Habits.—On two of the three occasions on which I saw this bird in the area it was hawking insects from a perch in a mango tree. On the third occasion it was perched in a bush close to a Magpie-Robin which was in full song.

Status.—Observed once in November and twice in February. On two occasions it was in an inspection bungalow compound, and on the third one in the Civil Lines at Shwebo.

Chelidorhynx hypoxanthum. The Yellow-bellied Flycatcher.

Status.—Observed once only, on 19 January at Kabo (under 500 ft.).

Rhipidura aureola. The Burmese White-browed Fantail Flycatcher.

Habits.—Two birds competing for an insect once flew within a yard of my face when I was standing in the open in white clothes, after which one of them perched on a hedge one foot above ground within three yards of me. On another occasion I saw a bird perched at the edge of the Mahananda tank.

Status.—Uncommon September to February; not observed in other months.

Rhipidura albicollis. The White-throated Fantail Flycatcher.

Habits.—Once seen hunting for food in the bottom of thick bushes. Twice seen bathing in a stream.

Status.—Seen throughout the year, including August. Usually uncommon, but on 23 April 1933 birds were very numerous at Kyaukmyaung on the Irrawaddy.

Lanius colluroides. The Burmese Shrike.

Identification.—Reddish tinge on lower plumage only once observed. The same bird also had the lores almost white.

Voice.—Once in June I saw a bird uttering an unusual whining call.

Habits.—I once observed a bird rubbing insects long and hard on a twig before swallowing them.

Status.—Common most of the year, but in March they began to disappear and I never saw a bird in May. In June they became exceedingly common and remained so during July, after which their numbers fell again to normal

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

until the following March. On their re-appearance in June the adults were generally very noisy and excited, flapping their wings and flirting their tails, I never saw any other sign of mating or nesting, but have seen young birds from June to August, the earliest date being 16 June.

Lanius nasutus. The Black-headed Shrike.

Status.—Only seen once in the area, on 21 January at Wetlet. Clearly distinguishable from Burmese Shrike by larger size and much lighter upper plumage.

Lanius cristatus. The Brown Shrike.

Status.—Uncommon. Only observed three times, October to January. Earliest 9 October.

Tephrodornis pondiceriana. The Common Wood Shrike.

Habits.—Once observed hawking flying insects from a perch in a tamarind tree.

Status.—Uncommon even in the cold weather, and not observed between 23 April and 21 October.

Pericrocotus peregrinus. The Small Minivet.

Status.—Only observed once, in jungle near the Shwebo-Kyaukmyaung road. A flock of 8 or 10 birds was flitting restlessly and erratically like bees about the highest trees.

Pericrocotus erythropygius. Jerdon's Minivet.

Habits.—Never observed in high trees, but usually perched on bushes or long grass, or even on the ground.

Nesting.—Birds seen at nest 4 ft. up in a small cutch tree on 22 July. Nest was a shallow cup made of fine grass very compactly cemented with saliva, ornamented with bark and remarkably well camouflaged. Three eggs with very good protective colouring. On 23 August I saw another nest in a similar position and similarly constructed and camouflaged. The sole occupant was a young cuckoo, being fed with caterpillars.

Status.—Seen once in February and once in March; otherwise only between June and October, and uncommon even then.

Lalage melaschista. The Grey Cuckoo-Shrike.

Status.—Observed on 20 August in jungle near the Shwebo-Kyaukmyaung Road, and once in November in the compound of Taze inspection bungalow.

Graucalus javensis. The Large Cuckoo-Shrike.

Habits.—Flight slow and direct. The seven observations made in the area were all in bungalow compounds.

Status.—Uncommon, and only seen between 7 October and 15 February.

Artamus fuscus. The Ashy Swallow-Shrike.

Voice.—In October I have heard birds on the wing uttering a plaintive call.

Habits.—Nearly always seen on or around toddy palms or telephone wires. One of a nesting pair was once seen fearlessly driving away a crow.

Nesting.—The pair just mentioned were nesting at the top of a toddy palm on 22 March. Grass bents were being used in construction.

Status.—Never observed between 22 March and 14 June, otherwise in every month, but never common.

Dicrurus macrocercus. The Black Drongo.

Identification.—A noticeable glossy blue sheen occasionally observed on plumage.

Voice.—The usual rather raucous call was sometimes punctuated at frequent intervals by a beautiful clear whistle—an amazing contrast. Another

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

call was much like the harsh chatter of a shrike, and others might well be mistaken for an iora's. Possibly this is mimicry.

Habits.—Several birds once observed in company with a nightjar at dusk, hawking insects a few inches above the ground from a standing position on the surface of a road. On another occasion I saw more than 12 birds, in company with some Jerdon's Mynahs, swooping down from perches to pick food from the surface of a small pool.

Nesting.—Nest never observed in the area, and fledglings only once. In the Mandalay district, however, I once saw a nest in a *kokkobin*, level with the window of an inspection bungalow, and about ten feet from it. Sometimes both parents were away foraging for food at the same time, but usually they were away alternately, while the other one brooded the young. They always returned to the nest with empty beaks and fed the young by regurgitation.

Status.—Observed in every month. Very common during the rains and cold weather, but numbers gradually decreased during February until in March and April it was very seldom seen. During May and June numbers increased gradually, until it became very common again in July.

Dicrurus leucophaeus. The Pale Ashy Drongo.

Identification.—In the field the tail appears more widely and more deeply forked than the Black Drongo's.

Status.—Only observed in the area on four occasions, all between 27 November and 16 April, and on each occasion in the compound of an inspection bungalow.

Chaptia aenea. The Bronzed Drongo.

Status.—Only two observations. On 23 June 1932, two birds were seen flying from tree to tree, calling harshly, near Tantabin, at the tail of the Yeu Canal system. They were noticeably smaller than Black Drongos. On 28 October 1933, a single bird was seen in a tree on the Old Mu canal, and noted as no bigger than a Green Bee-eater.

Chibia hottentotta. The Hair-crested Drongo.

Status.—Observed twice only, in June and November. On the latter occasion it was perched among four King-Crows, and the stouter build was very noticeable.

Dissemurus paradiseus. The Large Racket-tailed Drongo.

Status.—Seen four times, all between 13 December and 25 March, three times in the Civil Lines at Shwebo. On one of them (10 March) the bird was much dishevelled, with both outer tail feathers missing, but identified from the conspicuous crest. Possibly it had been mobbed as an intruder to the area.

Acrocephalus stentoreus (? or arundinaceus). The Great Reed-Warbler.

Status.—Observed once only, in January, on reeds in Wetlet Lake, when a number of birds were present. Probably sub-species *brunnescens* (Indian race), as lower plumage was recorded as 'all white, with no sign of streaks'.

Orthotomus sutorius. The Tailor-bird.

Identification.—When perched, the tail is usually held straight out behind. From October onwards it is much shorter than during the rains; one record I made in December is of a party of several birds in full plumage, but with tails only about a quarter of the total length. A black spot on the side of the neck becomes conspicuous when the bird is calling.

Nesting.—On 19 October an adult with food in bill was twice seen visiting a bush; presumably feeding young, but nest was not found.

Status.—Observed in every month except January, but never very common.

Cisticola juncidis. The Streaked Fantail-Warbler.

Local name.—In the Mandalay district I have heard this bird called *nat-pi-so.*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Voice.—The usual call is reminiscent of two stones struck together, like a Chat's.

Habits.—Not found very retiring at any time of year. Frequently observed perched on grass stems, and in the cold weather flying short distances, calling the while, then settling. This contrasts with the mounting flights indulged in during the rains.

Nesting.—Nest-building observed 1 June at the earliest and 5 September at the latest. Nest sometimes 2 ft. from the ground.

Status.—Uncommon in November and not observed in December or January, but common in all other months.

Franklinia gracilis. Franklin's Wren-Warbler.

Habits.—Observed in paddy fields, both wet and dry, and in swamps; and I have seen it on a telephone wire. When perched, it sometimes jerks the tail in all directions as vigorously as it does in flight, and bobs the body up and down.

Status.—Observed only in June and September, and distinguished from Bevan's Wren-Warbler at that time of year by absence of the white eyebrow.

Phylloscopus affinis. Tickell's Willow-Warbler.

Identification.—In the field upper plumage appeared to me as olive-brown, not olive-green.

Status.—Observed on three occasions, in November and January, on tank bund and in inspection bungalow compounds. Identified by absence of wing bars, pale yellow lower plumage, and conspicuous yellow eyebrow.

Phylloscopus fuscatus. The Dusky Willow-Warbler.

Status.—Observed occasionally from November to February, not always in damp situations.

Prinia inornata. The Tenasserim Wren-Warbler.

Voice.—Call reminiscent of grasshopper or cricket, sustained sometimes for ten seconds or more without a pause; uttered both on perch and in flight, in the former case with the head thrown back; only heard during the rains.

Habits.—Very bold; it will approach within a few feet of one, in full view. I have seen it perched on a low palm tree, on a telephone wire, and among paddy stubble, as well as in more usual terrain, such as rushes and standing paddy.

Nesting.—A nest found on 28 September, at the top of a grass clump 18 ins. above water, contained one nestling and one egg. This nest was of the purse-shaped type, and very big for the contents.

Status.—Recorded in every month except April, and common during the rains.

Oriolus chinensis. The Black-naped Oriole.

Identification.—I found that wing and tail coverts of females and young birds showed more green than yellow in the field.

Voice.—Once in February, I heard a male calling with a harsh croak.

Habits.—Frequented bungalow compounds and open country near Shwebo. Young birds have been seen collecting caterpillars from the ground and taking them into trees to eat.

Nesting.—Female seen carrying nesting material as early as 11 April.

Status.—Observed in every month; noted as especially numerous in November.

Oriolus xanthornus. The Black-headed Oriole.

Habits.—Seen only in trees in inspection bungalow compounds and in thin jungle, never in open country or on the ground, like the Black-naped species.

Status.—Much less common than the Black-naped, but observed in all three seasons.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Sturnia malabarica: The White-winged Mynah.

Identification.—Distinguished from Jerdon's Mynah, when colour of bill was not noticeable, by the smaller size, the chestnut under tail, and the lighter grey wings. It is, too, a more shapely bird.

Habits.—Once observed hanging upside down while feeding. The flight is rapid.

Status.—Uncommon in the area; only observed in March, April and September.

Gracupica nigricollis. The Black-necked Mynah.

Habits.—Feeds sometimes on pipal buds. Occasionally collects in large flocks.

Nesting.—One nest seen was made mostly of straw, and another of sticks and straw. Nest building observed 21 August (latest).

Status.—Recorded in every month and noted as common in January, May and October.

Gracupica burmanica. Jerdon's Mynah.

Habits.—I have seen them, too, feeding on pipal buds.

Nesting.—I have seen nestlings being fed 10 August, latest. On one occasion in July, a pair was seen attacking a 3 ft. long snake, which was climbing a mango tree, presumably after their nest. They knocked it off the tree and continued to attack it as it made off.

Status.—Common in every month.

Acridotheres tristis. The Common Mynah.

Habits.—This species also feeds on pipal buds. In courting, the male erects his neck feathers and bows to the female.

Nesting.—Nest twice observed under eaves of houses, within 2 or 3 ft. of a Spotted Munia's. One nest, in which the young were being fed on 16 July, was being relined with sticks on 1 August. On 21 August the new brood was being fed with caterpillars, and they were still being fed on 2 September. On 29 September fresh sticks were being taken in, and by 7 October the third clutch was apparently being brooded. By 16 October the young were being fed, and were still being fed on 8 November. These dates give an incubation period of not more than 17 days, and a fledging period of at least 24 days.

Another nest was observed under construction on 7 November, while the earliest observation of nest-building was on 24 April. In the latter case, the young were being fed for several days before 13 May, again giving a probable incubation period of less than 17 days.

Status.—Common in every month.

Æthiopsar fuscus or ? **Æ cristatellus.** The Jungle Mynah.

Identification.—In many birds, the upper plumage was much browner than normal, the bill and legs much paler and the curl of feathers above the nostrils much less pronounced. Possibly some of these were young birds, but I have one record of a pair in that plumage which were feeding young. Probably the more common and darker birds were the Siamese race, and the less common and paler ones the Indian race.

Habits.—Frequently seen with cattle and buffaloes, often perched on their heads. I have seen them feeding on young pipal buds and on flowers of the cotton-tree. They were sometimes in mixed flocks with Jerdon's and Collared Mynahs. On 13 September 1933, at Shwebangon, many flocks were seen in flight, one of them comprising 70 to 80 birds.

Nesting.—The only nest observed in the area was on 12 June, when a pair were feeding young in a hole 12 ft. up in a *tanaungbin* in the open paddy fields. (This was the pair in the browner plumage referred to above.). On 21 August

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

one year a bird was seen in flight carrying what I thought to be food, but may have been nesting material.

Status.—Observed in every month. Recorded as common in September and November, and uncommon in February and March.

Æthiopsar albocinctus. The Collared Mynah.

Identification.—The tuft of feathers above the nostrils is much smaller than that of the Jungle Mynah. This is very noticeable in a mixed flock.

Habits.—On one of the two occasions that I saw it in the area I saw a flock of 6 to 8 birds, with 2 or 3 Pied Mynahs, on a bush in Wetlet Lake. On the other occasion there were large numbers in a cotton tree in full flower, in company with Jerdon's and Jungle Mynahs.

Status.—Only seen in January and February.

Surnopastor contra. The Pied Mynah.

Habits.—On one occasion in October I saw three birds together, and on another in February I saw a party of nine; otherwise I only saw them singly or in pairs. In January, at Wetlet Lake, birds were much more numerous than ever seen elsewhere in the area.

Nesting.—One nest seen, apparently complete, on 8 May. Another one was in a bungalow compound, 30 ft. up in a tree. Although this nest was very obvious, the birds were very cautious in approaching it. Only nine days before I saw young being fed, feathers were still being taken in for lining. Both birds chased away a magpie-robin which settled close by, but took no notice of a coppersmith.

Status.—Recorded in every month except July and August, but never common.

Ploceus infortunatus. The Eastern Baya Weaver-bird.

Identification.—Earliest signs of breeding plumage observed 17 April. Full breeding plumage recorded on 10 May (earliest), and on 9 September (latest). Some cocks still with traces of breeding plumage observed on 17 December.

Nesting.—Most of the numerous nests seen were overhanging water, but one solitary nest was overhanging a thorn bush. This was possibly regarded as an alternative means of protection against vermin. Nests were usually in colonies, but solitary nests were recorded on several occasions.

I have two records of nesting in company with the Striated Weaver-bird. In one case there was a finished nest of each species, each with three eggs, in the same bush.

In one colony building material was being taken mostly from plantain leaves, but partly from old nests and partly by stealing new material from other nests. One large colony of nests was built partly in a mango tree over a canal and partly in plantain trees alongside. I frequently found them suspended from the funnels of old nests, sometimes attached by the usual rope, sometimes attached directly, giving the appearance of a two-storied dwelling. In such cases, however, I always found the funnel closed by weaving, so that the upper 'storey' was no longer accessible. In one colony the process had in two cases been repeated twice, giving three storeys each. In one case the connection between the upper and middle 'storeys' was a rope and that between the middle and lower a funnel. In the other, both connections were funnels.

In one colony several nests had funnels at least 18 ins. long. In two cases the 'cock nests' of a colony were all found to have mud on the inside, whereas none of the finished nests contained any. In fact I have no record of a finished nest in the Shwebo district containing mud, and it appears to be unusual. In one colony observed on 23 September there was only one half-finished, or cock, nest. On the other hand, groups of old cock nests were seen on two occasions, with no finished nests nearby.

The earliest date on which finished nests were observed was 24 May, much rain having fallen during the month. Nest building was observed as late as

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

16 September. On 2 October one year a cock was still engaged in lengthening the funnel of a nest containing young, and a nest containing young was once seen on 19 October.

In one colony which I watched under construction the bulk of the work was done by the cocks. The hens only occasionally helped the cocks to weave, or did a little on their own. The hen would sometimes perch on the far side of the nest, and critically watch the cock at work. One day, on the other hand, I watched the hens of a colony busily feeding their young on grasshoppers, while all the cocks perched by the nests and tried to steal the food as it came in.

Status.—Except for one doubtful observation in January, I never saw this bird from November to March. In all other months it was common.

Ploceus manyar. The Striated Weaver-bird.

Identification.—Full breeding plumage observed on 10 May.

Voice.—I have heard them chattering noisily while nest-building.

Nesting.—I twice observed nests alongside Bayas' nests, once in a reed bed in Wetlet Lake, and the other time in *kaing*-grass at Kabo. Nests with the entrance at the side and with no funnel were seen on two occasions. In one of these cases the nest was also unusual in being suspended at two points only. This species sometimes, if not always, sticks dung instead of mud inside its nests. It is plastered along the inside edge of, I think, all cock nests, but of few, if any, egg nests.

A nest was observed under construction on 10 October, and I once found unfledged young in a nest on 9 November.

Status.—Observed in every month from May to November, but not outside that period.

Ploceïla chrysæa. The Golden Weaver-bird.

Identification.—Apart from the buff eyebrow, males in winter and females at all seasons were distinguished from the Eastern Baya by the darker upper plumage, and by the reddish brown tinge on cheeks, throat and breast. Earliest date of full breeding plumage was 25 May and the latest 15 November. Partial breeding plumage was seen as late as 17 December.

Habits.—Generally seen on vegetation growing in water or swamps, but once in the cold weather a large flock was observed on telegraph wires. A mixed flock of this species and Eastern Bayas was once recorded in November. It is sometimes very confiding.

Nesting.—I found that nests were built of much coarser grass or leaf strips than those of the other Weaver-birds, and lined with softer grass. The entrance was frequently furnished with a small porch of fine grass and was small for the size of the bird. One nest in a bush had just been begun by twisting strips of very tough grass or palm leaf round the twigs. Another, also in a bush, was suspended from two twigs.

On one occasion the female was bringing all the material for a nest, while the male perched nearby and displayed, both to her and, in her absence, to another female which had eggs. On other occasions, however, the male was seen at work.

Nest-building not observed before 16 June or after 20 September, but in Mandalay district I have seen it in progress on 18 October.

Eggs with darker spots, or mottled, were common.

Status.—Observed in every month between 25 May and 26 February, but never in March or April.

Munia atricapilla. The Chestnut-bellied Munia.

Identification.—Birds in immature plumage were once seen on 30 April—presumably young of the previous year.

Habits.—Generally found among rushes, also in long grass and paddy. Sometimes in company with Spotted and Red Munias. Seen feeding on grass seed.

Status.—Recorded in every month except February and May, but not very common, especially in the dry weather.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Uroloncha punctulata. The Spotted Munia.

Habits.—A flock of some hundreds was once seen in November, feeding on ripening paddy. A flock of a dozen, seen in September, was noted as very tame. On one occasion in April, some birds were seen roosting in a bush at dusk with a large flock of House Sparrows. On another occasion, also in April, several birds were in rushes with Chestnut-bellied and Red Munias.

Nesting.—Birds never seen singly or in pairs before 21 June, and nesting not observed before 10 July. In one case growing grass was picked and taken to an old mynah's nest under the eaves of my bungalow, but I do not think that eggs were laid in it. One nest was built under bungalow eaves within two or three feet of both a Mynah's and a House Sparrow's, and another almost touching a Mynah's. Other nests seen were 5 to 8 ft. up in small trees and in bushes in wet fields, and were sometimes very conspicuous. Materials were dead grass, green grass, straw and pampas grass, some nests being built entirely of one or other of the two last-named materials. When pampas grass was used, the white silky part was on the outside, giving the appearance from a distance of a large mass of cobwebs—a wonderful structure, with the egg cavity 5 or 6 ins. deep.

The birds sit very tight on their eggs; one remained on them while I shook the nest. A nest with 2 eggs was found on 6 November, on the 7th it contained 3, on the 8th 4. By 15 November there were 6. Another nest had 6 eggs and another about the same number. In a fourth case, however, there appeared to the touch to be at least 10.

15 November was the latest date on which eggs were found, but a nest with young was found on 28 November.

Amandava amandava. The Red Munia.

Habits.—Very tame. Flocks of up to 100 were seen out of the breeding season. Even during the breeding season, on 9 October, I once saw three adult males together. A number of birds were seen on 30 April one year in company with Spotted and Chestnut-bellied Munias, but there were no males in breeding plumage among them.

Status.—Uncommon, but seen in all seasons.

Passer domesticus. The House Sparrow.

Habits.—Large flocks were seen in March and April, as well as in the rains. Spotted Munias were once seen roosting with this species, and Pegu House Sparrows were seen in mixed flocks with them several times.

Nesting.—One nest, three feet up in a small thorn tree, had the entrance at the top, not at the side; the two eggs which it contained were so thickly mottled with dark brown that the background was hardly visible. Another nest, under the eaves of a bungalow, was about half finished in 24 hours from the start.

Status.—Seen in every month and common in most.

Passer montanus. The Tree Sparrow.

Habits.—I have seen them in the Mu river bed at Yeu and on the canal headworks at Kabo. They were not so common about buildings as in the Minbu district.

Status.—Observed in every month, but not so common as the House Sparrow, especially in the cold weather.

Passer flaveolus. The Pegu House Sparrow.

Habits.—Frequently found in and about bungalows, especially in the dry weather; it also frequented scrub jungle, paddy fields and toddy palms. In the rains and cold weather it was often in flocks of up to 30 or 40, occasionally in company with House Sparrows. Once, in April, I saw a pair hawking flies and returning to the same perch, just like flycatchers.

Nesting.—Nesting was observed in an old woodpecker's hole, in the rain gutter of my house, and in the ceiling of an inspection bungalow. Feathers

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

were seen being taken to all of these sites, and on one occasion a bird was seen walking about on the outside of a Pied Mynah's nest, with the owner inside, and stealing two or three feathers from it.

Status.—Observed in every month, and usually common.

Emberiza aureola. The Yellow-breasted Bunting.

Status.—One observation only, on 30 April 1933, when a party of three birds was seen on rushes in the Mahananda tank, near Shwebo town.

Delichon urbica. The House Martin.

Status.—Two observations, both in January 1934, at Wetlet Lake. On the 23rd of that month, numbers of birds were flying about over the reeds. On the 28th, a bird was identified flying about over shallow water with numbers of other swallows or martins.

Riparia riparia. The Eastern Sand Martin.

Status.—Two observations only. On 10 October 1932, a single bird was seen perched on grass in the water of the Mahananda tank. On 28 January 1934, a number of birds were seen, in company with Eastern Swallows and at least one House Martin, flying about over the shallow water of Wetlet Lake.

Riparia paludicola. The Indian Sand Martin.

Status.—I have no certain record of this bird in the Shwebo irrigated area. On four occasions, between 12 October and 13 April, birds were seen which were probably this species, but may possibly have been Eastern Sand Martins, of whose existence I was not at that time aware. On 13 April 1932, hundreds of birds, of one or the other species, were at nesting holes in the bank of the Mu at Yeu, while on 16 March 1933 I counted a flock of more than a thousand on a sand-bank at Kabo.

Hirundo rustica. The Eastern Swallow.

Habits.—In the N. Shan States in December I once saw them flying about in company with Wire-tailed Swallows.

Status.—Observed in every month of the year. On 22 June 1933, I saw a single bird. None had been seen earlier that month, so probably it was an exceptionally early arrival. Another was seen on 5 July of that year, and on 24 July large numbers of birds were recorded.

Unusually large flocks, probably on migration, were recorded in the area on 9 September, 26 March and 3 April. Outside the area, near Sagaing, a very large flock, evidently on migration, was observed on 23 May 1932, on the telegraph wires. There had been a monsoon storm the previous night, and they were very dishevelled, exhausted and tame, and busy preening themselves.

[A solitary bird was seen on 5 September 1932, at Wetlet, which was possibly of the western race, *rustica*. It was perched on a rush in a paddy field and was very tame. Close by, on a telegraph wire, were three or four Eastern Swallows, from which it differed in having the forehead ashy-grey and the breast and abdomen greyish-white tinged with pink. It appeared to be a young bird.]

H. r. tytleri. Tytler's Swallow.

No certain records of it from the irrigated area. The large flock of swallows seen near Sagaing on 23 May 1932, however, contained some of Tytler's as well as the Eastern race, and a solitary bird was seen flying about over the Irrawaddy at Kyaukmyaung on 22 April 1933.

Hirundo smithii. The Indian Wire-tailed Swallow.

Status.—Only observed once in the area, on 13 July 1932, when a party of three birds was seen in flight in the Shwebo Cantonments. (In the Mandalay canal area, in 1926-27, a pair was always to be seen at one particular spot,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

but apart from them I only saw the bird in that area on one other occasion in the course of 3½ years.)

Hirundo daurica. The Striated Swallow.

Status.—Only one observation, on 7 November 1931, when two or more birds were about the inspection bungalow at Thayetkan. There had just been 48 hours continuous rain from the north and one of the birds, although strong on the wing, was very tame, as if exhausted. This bird's plumage was rusty black, and it was possibly a young bird of Hodgson's race on migration.

Motacilla alba [ocularis Swinhoe] The Streak-eyed Wagtail.

Status.—Only observed once, on 12 November 1933. A single bird was feeding in the shallow water of a stream near Kyaukmyaung in company with a White-faced Wagtail. Identified by the grey line across the side of the head through the eye.

Motacilla alba [dukhunensis Sykes] The Indian White Wagtail.

Status.—Only one observation, on 13 October 1933. A single bird was seen on the bank of the Old Mu canal. Identified by white sides of head, grey crown and upper plumage, black chin and throat.

Motacilla alboides. Hodgson's Pied Wagtail.

Status.—Observed twice in the area, on 12 October 1933 and 5 February 1934. On the former date a single bird was feeding on a patch of floating rubbish in the Mu river at Kabo. On the latter date another single bird was seen feeding in the mud at the edge of the Mahananda tank. It frequently hovered over the water nearly motionless, and once perched on a stick. In the case of the first bird, the black ear-coverts were noted, and in the case of the second the black sides of the neck.

Motacilla leucopsis. The White-faced Wagtail.

Identification.—Birds with the all-black upper plumage of summer were seen on many occasions in the cold weather, e.g. 6 December, 12 January, 7 March.

Habits.—On one occasion I observed a number of birds in company with a single Grey Wagtail. Normally they do not appear to associate with other species. Birds were usually seen singly or in pairs, but occasionally in flocks. On one occasion at least 20 birds were seen roosting in a single bush with a White-breasted Kingfisher and three Pied Kingfishers. On two occasions birds were seen perched on telephone wires, and another bird was seen almost hovering over water, catching insects.

Status.—Very common throughout the cold weather. The earliest record was 16 September; birds being numerous by the 22nd. The latest observation was 23 April.

Motacilla cinerea. The Eastern Grey Wagtail.

Identification.—Most birds I saw had the chin, throat and upper breast white. In one, however, the throat and breast were suffused with yellow, in another the breast was yellow, divided by a white band from the yellow abdomen, and in a third the throat too was yellow.

Habits.—Nearly always seen singly and apart from other species. Once in the Mandalay district, however, I saw a bird in company with a White-faced Wagtail, and once in Shwebo another one among a number of that species.

Status.—Observed in every month from September to April, but not usually common. On 21 April, 1933, however, a large number of birds were seen along the edge of the Kadu Lake, possibly assembled for migration. Earliest date was 21 September, and latest 30 April.

Motacilla flava. The Grey-headed Wagtail.

Habits.—Usually seen singly, but occasionally in flocks of up to 20. A bird was seen one October feeding with Indian Pipits. On several occasions birds were seen walking about on floating vegetation.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Status.—Usually rather uncommon, but on three occasions, in November, January, and April, numerous birds were observed at the edges of lakes. Earliest date 4 September, latest 10 May.

Motacilla citreola. The Yellow-headed Wagtail.

Identification.—I saw a pair in full summer plumage on 8 April one year.

Habits.—I once saw this bird hawking insects just like a flycatcher and on another occasion continually hovering just over the surface of a lake. On several occasions I saw them on floating vegetation, a habitat of which this species seems to be particularly fond.

Status.—Single birds and pairs fairly common in the area, and on two occasions I found them numerous at the Wetlet Lake. I never saw one earlier than 10 November; my latest date was 8 May.

Dendronanthus indicus. The Forest Wagtail.

Status.—On 26 April 1933, I saw 3 birds feeding along the water's edge of the Mahananda tank, on the outskirts of Shwebo town. The plumage and the very curious sideways swaying of body and tail were unmistakeable. One bird was still at the same spot on 27 April and again on the 30th.

Anthus hodgsoni. The Indian Tree Pipit.

Status.—Not very common. Earliest date 7 November, latest 30 April.

Anthus rufulus. The Indian Pipit.

Identification.—Easily distinguished from the Burmese Bush Lark, which is also very common in the area, by the white edges to the tail.

Habits.—Not usually in flocks, but I once saw one of 30 to 40 birds in a wet fallow field in September. The bird was seen once or twice on sand-banks in the River Mu, which had little or no vegetation on them.

Status.—Common most of the year, though not so noticeable in the hot weather. Very large numbers were sometimes seen, especially round the Wetlet Lake and the Mahananda tank.

Alauda gulgula. The Small Skylark.

Identification.—The small dark crest is sometimes visible in the field, distinguishing it from the Burmese Bushlark.

Status.—Only observed five times in this area, three of the occasions being in December, one in March and one in May. On the latter occasion a pair was seen copulating, but no nest was ever found.

Calandrella raytal. The Ganges Sandlark.

Identification.—More than once I observed a small crest erected at intervals, especially when agitated.

Voice.—I once saw a bird singing high up in the air, after the manner of a skylark. On another occasion I recorded the voice, when in flight, as a trilling song.

Status.—Only seen in the bed of the River Mu, where it was fairly common in the dry weather. I never observed it between 17 August and 5 January.

Mirafra assamica. The Burmese Bushlark.

Voice.—Once in October I saw a bird calling with a monosyllabic pipe. On another occasion, also in October, I watched one chirping loudly while gradually approaching its nest. I have also seen it singing lustily from the extreme top of a *tanaungbin* instead of from the usual bush.

Nesting.—The nest referred to above was found as late as 6 October, and contained two nestlings. Pairing was observed as early as 3 April, and display on 13 April. In the latter case the bird was running about excitedly, stretching to its full height, bowing and singing, though the female was not to be seen.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I saw four nests in the area, all on the ground, two being concealed under low shoots of small trees, one under a tiny shrub, and one in a clump of rush stubble. All had the opening at the side and one at least had coarse grass on the outside and finer grass inside.

One of the four nests contained three young and another three eggs, so that a clutch of three does not appear to be very rare.

Status.—Recorded in every month. Fairly common.

Cinnyris asiatica. The Purple Sunbird.

Identification.—The earliest date I saw signs of breeding plumage was 18 November and remnants of it were seen as late as 15 August, in the shape of a little purple still visible on the flanks. The earliest and latest dates of full breeding plumage were 16 December and 22 June. Earliest signs of non-breeding plumage (viz. breast turning light in colour) were seen on 6 June and the latest on 16 December when a male was seen with still no sign of breeding plumage. The earliest date of full non-breeding plumage was 22 June, though a bird seen on 10 June had almost acquired it.

It seems that when breeding plumage is shed the whole lower plumage of the male turns yellow before the violet stripe is acquired, for I have seen a male on 10 July with the stripe extending only to the centre of the breast, and others on 14 August with only a dark patch at the base of the throat.

On one occasion in April I saw a pair with an obvious young bird, in which the lower plumage was a much brighter yellow than that of the mother, instead of the usual duller shade.

Voice.—I recorded this once as a 'loud, harsh, monotonous whistle'. On another orcasion, in May, a male chasing a female was calling loudly and continuously 'very like a tailor bird'.

Habits.—This bird seemed particularly fond of *kokkobins* and of bushes with yellow trumpet-shaped flowers, which I believe are allamandas. The latter are common in bungalow compounds, and were sometimes full of these birds. I once saw a male hovering, with its bill in the green foliage of a tree, just as if it were at a blossom. No doubt it was hawking insects. On another occasion I watched a pair making frequent sallies after flying insects from the top of a tall tree.

Nesting.—One nest I found (in Mandalay) was built only 18 ins. from the ground. The female on another one sat tight until I had approached to within a few feet.

Status.—Observed in the area in every month, but uncommonly from December to April.

Dicaeum cruentatum. The Scarlet-backed Flowerpecker.

Identification.—The steel-blue gloss on the wings was sometimes conspicuous. In one male which I saw, the whole lower plumage appeared pure white, not buff.

Voice.—A female I saw in January was calling loudly, very much like a tailor-bird. The *tchik-tchik* call is surprisingly loud for the bird's size.

Habits.—Once near Maymyo I saw a male hovering motionless in the air, to catch a flying insect. I mistook it at first sight for a butterfly. It had just been raining heavily and the bird then flitted about the wet trees, continually shaking rain drops off its wings. A male which I watched in the Shwebo area was flitting about a mango tree, sometimes on the lowest branches only a few feet from the ground.

Status.—Only observed three times in the area, all between November and January.

Picus viridanus. The Scaly-bellied Woodpecker.

Status.—Only observed three times in the area, a pair in February, and single males in June and July.

Picus canus. The Black-naped Green Woodpecker.

Status.—Seen once only, a single female in November, moving from stem to stem of toddy palms near Pauktaw inspection bungalow.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Dryobates mahrattensis. The Yellow-fronted Pied Woodpecker.

Habits.—Once observed feeding on a rope of creeper in scrub jungle at Shwebo, and running up *and down* with equal ease.

Status.—Only identified five times in the area, in September, October, March and April. Distinguished from the Fulvous-breasted, the Siamese Pied, and the Burmese Pigmy species either by the dark stripe on the side of the neck, the crimson on the abdomen, or both.

Micropternus brachyurus. The Rufous Woodpecker.

The only bird I identified in this area (on 8 April 1932) was drumming on a dead bark-less branch of a tree near the Yeu canal. The noise was similar to that of a branch creaking in the wind. It once uttered a succession of screaming notes, rather like a Pied Kingfisher. On a previous occasion, in the same locality, I had seen a Woodpecker, too far off to identify, drumming on a large tree and producing the same curious noise. This puzzled me until I saw the bird, as it was just like the creaking of a large bough, but there was no wind. The noise was tremendous for so small a bird. I have seen the bird several times in the Mandalay canal area.

Dinopium javanense. The Golden-backed Three-toed Woodpecker.

(? or the Himalayan **Dinopium shorii**).

Only seen twice in the area, in February and October, both times along the Old Mu canal. Distinguished from Tickell's species, which I have seen in other districts, by the smaller size, which was noted on each occasion as that of a Rufous Woodpecker.

Iynx torquilla. The Wryneck.

Identification.—The black line from the crown, ending in a black patch on the back, was usually conspicuous, and a black line through the eye down the side of the neck, sometimes so. I have, however, seen birds in September and October with these markings very faint.

Habits.—Most birds which I saw were solitary, but on 9 April one year I saw two together, and on 19 October two birds in a tree with a third in a bush close by. I did not find the bird shy or elusive. More than once I watched it feeding in the compounds of occupied bungalows, in one case while my dogs were running about. One note of a bird on the ground records it as 'very tame', while on another occasion a bird in a *tanaungbin* allowed me to approach within a few yards without leaving the tree.

I have watched it feeding on ants on a branch, and sometimes among dead leaves on the ground.

Status.—Observed fairly commonly in every month from September to April. Earliest date 12 September, latest 20 April.

Megalaima haemacephala. The Coppersmith.

Voice.—Although the bird is not so vocal in the cold weather as in other seasons, I have heard it calling in every month from November to February. During an unusually cold spell in December 1933, I noted it one day as calling loud and long in its usual tempo. In the previous month I had heard a bird calling much more slowly than usual, with a pause of about two seconds between each note. On one occasion in June I watched a bird calling in a jerky, irregular fashion instead of with the usual monotonous regularity.

Habits.—Usually stationary on its perch, but once in November I saw two birds running about the branches of a small tree. I twice observed birds feeding on berries. In one case, in March, they were being brought by one of a pair to its mate, which was perched on a branch and calling. The two berries which comprised the offering entirely filled the bill of the bird bringing them.

Nesting.—Of the two nests which I observed in use, one was 25 ft. up in the branch of a mango, and the other about 30 ft. up in a broken branch of a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

kokkobin. The latter had two entrance holes 18 ins. apart. One nest was in use on 14 February, and young were being fed in the other on 10 April.

Status.—Observed in every month. Fairly common.

Cuculus canorus. The Khasia Hills Cuckoo.

Status.—The only birds I saw in the area were two or three young ones which were round and about the Wetlet inspection bungalow on 8 and 9 October, 1933. When first seen on 8 October, two birds were feeding on worms or caterpillars in a fallow field with two Pied Crested Cuckoos. At intervals they perched on bushes and were not at all shy. On 9 October two or three birds were about the compound all day. Upper plumage was grey-brown with bars, lower plumage white with narrow bars, and one at least had a white nuchal spot and a white spot on the forehead. Feet were bright yellow, iris orange, and bill dark at tip, orange at base.

Hierococcyx fugax. Hodgson's Hawk-Cuckoo.

Status.—On 18 January 1934, at Kabo, a bird settled two or three feet up in a bush on the Mu river bank, immediately above a grass Owl which had just settled on the ground. Identified by size, which was larger than the Plaintive Cuckoo, powdery blue head and upper plumage, greyish-white lower plumage, and black bill.

Cacomantis merulinus. The Plaintive Cuckoo.

Identification.—The barring on the tail was usually a conspicuous feature. I once saw a partially albino bird, with a white patch on the left wing. Once or twice I mistook them at first sight for Wrynecks.

Habits.—Birds were seen several times perched on telephone wires, twice clinging to rushes, and once on the fence of a bungalow compound. Most birds I saw, however, were on bushes. I have seen them eating worms and once a caterpillar, which the bird shook vigorously before swallowing whole.

Status.—Common in the cold weather, but never seen between 10 April and 30 September. On 28 November, 1933, I found birds very numerous in paddy fields at Myittaw, and on 18 March 1933 they were almost the commonest bird seen during the morning, 'very large numbers' being recorded. Possibly they were assembling for migration to the hills.

Clamator jacobinus. The Pied Crested Cuckoo.

Habits.—I once saw two birds feeding on worms in a fallow field. Always seen singly, except for several occasions in September and October when I saw two together.

Status.—Fairly common in the rains, but never seen between 9 November and 26 May. In September 1933 I found them commoner than usual. Birds in immature plumage were seen on 14 October and 9 November.

Clamator coromandus. The Red-winged Crested Cuckoo.

Identification.—From the side, the white collar is conspicuous. In flight the long tail undulates like that of a Paradise Flycatcher.

Habits.—Two birds seen together on one occasion, otherwise always seen singly.

Status.—Uncommon. Only six observations, all between 19 July and 16 November.

Eudynamis scolopaceus. The Koel.

Identification.—At least one female which I saw had chin, throat and breast dark brown, striped and spotted with white, instead of vice versa.

Voice.—I never noticed the female's *kik-kik-kik* call, but more than once saw one uttering a monosyllabic screech. Twice, in different localities, I heard a bird calling on 1 February, and in 1934 birds were calling frequently by 5 February.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

I several times heard birds calling in August and September and once on 4 October. A male seen on 19 July was calling very hoarsely.

Habits.—I have one record of a male feeding on the ground, in a patch of scrub jungle; also of one bird of a pair feeding the other in a neem tree. A female was once seen in a young pipal tree, picking large berries and swallowing them whole.

The bird seen calling hoarsely on 19 July was perched in full view, unlike its usual furtiveness, but was ignored by several crows in the same tree.

Status.—Recorded in every month from February to October. Commonest in March, April and May, but there were numbers about on 3 July 1932. Not seen or heard between 4 October and 1 February.

Rhopodytes tristis. The Large Green-billed Malkoha.

Identification.—In size, shape and flight, the bird often reminded me of a Red-billed Blue Magpie. In the field the whole plumage, except the white tips to the tail feathers, sometimes looked very dark grey or black.

Habits.—I once saw a bird jumping about a tree like a squirrel. I usually found it very shy and skulking, but once saw one on the drive of a bungalow in Shwebo.

Status.—Only six observations in the area, in March, June, October and November; also one in April at Kyaukmyaung, on the Irrawaddy near by.

Centropus sinensis. Hume's Crow-Pheasant.

Voice.—Once heard calling on a very hot April evening, when most birds were silent and still.

Habits.—Fairly often seen in trees, twice in full view on the top of one.

Status.—Recorded in every month; comparatively uncommon in the cold weather.

Psittacula eupatria. The Large Parakeet.

Status.—Only seen once in the area, on 23 March, 1932.

Psittacula krameri. The Rose-ringed Parakeet.

Habits.—I have seen birds feeding on neem fruit in May, and on their seeds in June.

Once, at the end of January, I watched a male pecking at a female's head and pawing with one foot, just like a puppy at play—presumably courting.

Birds were usually seen singly or in twos or threes, even out of the breeding season; on the other hand, I have seen flocks in March and April.

Status.—Observed in every month except December. Usually common, but not recorded between 2 November and 16 January.

Coracias benghalensis. The Roller.

Voice.—One of a pair seen in a tree on 10 June was uttering a very faint whining note.

Habits.—I twice saw birds feasting on a swarm of flying insects in company with other species.

Nesting.—No nests found, but on 8 May 1933 a bird appeared, from its behaviour, to be nesting in a *kokkobin*, and on 20 June 1933 an evident young bird was seen.

Status.—Observed in every month. Usually common, but less in evidence from February to May.

Eurystomus orientalis. The Broad-billed Roller.

Status.—Only seen once, and then not in the irrigated area, but a little outside it, in the jungle close to the Shwebo-Kyaukmyaung road.

Merops orientalis. The Green Bee-eater.

Identification.—On two occasions, both in September, birds were noticed with a much lighter chestnut crown than usual.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Habits.—Flocks were recorded in May, June and October, one in June being a large one.

Nesting.—No nests observed in this area, but copulation once seen, on 30 September. In the Mandalay district this species and the Blue-tailed were seen together in May at nesting holes in the vertical bank of the Thapangaing outfall channel of the Mandalay canal.

Status.—Observed as common in every month, but not so numerous from February to June as at other times.

Merops superciliosus. The Blue-tailed Bee-eater.

Habits.—On one very hot oppressive evening in April, when most birds evidently found it too hot to move, numbers of these birds were hawking insects very actively. I have more than once seen them hawking from a perch on telegraph wires.

I once saw one catch a large dragon-fly, which it swallowed whole.

Nesting.—I saw birds at nesting holes in the Mu river bank at Yeu on 22 April 1932. On 21 May my presence excited the birds greatly for some reason, numbers wheeling round my head, accompanied by Common and Black-bellied Tern and by one or two Little Pratincoles. The birds were still there on 5 June, although the river had in the meantime been nearly up to the holes. In June of the following year I saw a nesting colony in the bank of a canal near Shwebo, within 20 yards of which people were continually passing. As noted under Green Bee-eaters, I once saw both species nesting together in the Mandalay district.

Status.—Earliest date 6 April, latest 10 November. Seen in all months between those dates, but rather local. In favoured localities, such as the Wetlet lake and the Mahananda tank, I found them numerous from July to October. On 6 September 1933 I saw an unusually large flock, of 200 to 300, on telephone wires at Wetlet.

Alcemerops atherioni. The Blue-bearded Bee-eater.

Status.—Only seen once in the area, on 27 November 1932, when two birds were observed perched high up in a cotton tree in the compound of Tazé inspection bungalow.

Ceryle rudis. The Pied Kingfisher.

Habits.—I once saw a bird dive ten times without catching anything, and on another occasion I saw one make a slanting dive, instead of the usual vertical one. Birds were usually seen singly or in pairs, but parties of up to five were seen occasionally. Three or more birds were seen on one occasion roosting in company with a White-breasted Kingfisher and at least 20 Wagtails (Alba) in a small bush, growing in the water of the Old Mu canal. In Mandalay I have seen a bird fishing in the moat of Fort Dufferin, and once, in March, saw a party of five there.

Nesting.—No nests definitely observed in the area, but on 10 May 1931 three birds objected strongly to my presence near some holes in the Mu river bank at Yeu.

Status.—Recorded in every month. It seemed to get very scarce in September for some reason, a phenomenon which I noted in the Minbu district also.

Alcedo atthis. The Common Kingfisher.

Habits.—On 22 April one year I watched a bird at a stagnant pool in company with four species of Stork, three or four species of Egret, Common Herons, Pond-Herons, a Common Sandpiper, and a Brahminy Kite. The Kingfisher held its ground at my approach until all except the Kite and the Pond Herons had left.

I once saw a bird settle for a few seconds on a road, picked up a winged insect, and fly up to a perch to swallow it.

Status.—I never saw this bird in the area between 22 April and 10 August. (I later noticed the same phenomenon in the Minbu district). For the rest of the year, it was seen in every month, being numerous in September, October, and November.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Ramphalcyon capensis. The Stork-billed Kingfisher.

Status.—Never observed between 8 April and 20 September, and not very common during the rest of the year, though seen in every month. I noted it as commoner than usual in early February 1933, and in mid-January 1934.

Halcyon smyrnensis. The White-breasted Kingfisher.

Habits.—I once saw a bird roosting in a small bush in company with three or more Pied Kingfishers and twenty or more Wagtails (*M. alba*). Usually seen near water.

Nesting.—The only nest I saw was on 10 May 1931, in the bank of the R. Mu at Yeu. One parent was catching small fish, and taking them into the tunnel, which was more than two feet long.

Status.—Observed in every month except April. Their numbers seemed to vary curiously during the year. In January and February 1933 they were numerous. On 9 February 1933 about 15 were counted along the Shwebo canal between Kabo headworks and Shwebo. During the same trip on the following 3 April, however, not a single bird was seen, and the bird was not seen again in the area until 8 June. By 19 July they had become very numerous again, especially perched on telephone wires. None were seen during August, but on 22 September they were once more numerous. October again was a blank month, but by 25 November they were 'very numerous indeed'.

Anthracoceros malabaricus. The Pied Hornbill.

Status.—Not observed in the area, but I record here an observation made on 6 January 1929 along an irrigation channel from the Taunggan tank, Mandalay district. A single bird was perched on top of a dead tree. Its occurrence in cultivation in the plains appears to be unusual.

Upupa epops. The Hoopoe.

Habits.—I have two records of birds dust-bathing.

Nesting.—None observed.

Status.—Seen in every month, but uncommon from March to May. Birds seen on 18 April 1931 and 2 April 1933 were noted as the first seen for a long time, and none were seen between the latter date and 31 May 1933. By 23 June that year they had become fairly common again, and by 19 July were numerous. Even out of the breeding season, birds were seen more often singly or in couples than in parties. Young birds (with the fawn in the plumage undeveloped) were only seen once. This was on 22 July 1932 when two or three were with their parents on the Shwebo golf-course, the birds being unusually timid.

Cypsiurus parvus. The Palm Swift.

Habits.—At least three times I saw flocks well away from toddy-palms,—half a mile or so in one case. One of these, seen on 21 March flying about over the Mahananda tank, was probably a thousand strong.[1] The air was thick with birds. I once watched another flock of about 100 flying to and fro some 20 ft. above a fallow field surrounded by paddy stubble. They were evidently hawking insects, but the latter were so small as to be invisible even from a distance of a few feet.

Voice.—All the three flocks seen away from palms were quite silent.

Status.—Seen in every month. Common.

Hemiprocne coronata. The Indian Crested Swift.

Status.—Observed once, in the jungle near Kyaukmyaung on the Irrawaddy, when a flock was flying about high up. They were recorded as no bigger than Palm Swifts, but had the breast and abdomen white, so that I have no doubt that the height caused me to underestimate the size and that they were actually this species. Later, in the Minbu district, I got to know the bird well.

(*To be continued*)

[1] *Collocalia?*—Eds.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

FISHES OF THE KUMAON HIMALAYAS

BY

A. G. K. MENON, M.A., Research Scholar

(*With a text figure*)

(Communicated by DR. S. L. HORA, Director, Zoological Survey of India)

INTRODUCTION

Though angling in the Kumaon Lakes is a popular pastime for lovers of sport in these invigorating hills, our knowledge of their fish fauna is very meagre indeed. The first record of any fish from this region is by Day[1] who in 1878 noted that the Naini Tal specimens of *Barbus conchonius* 'have the dorsal spine much less coarsely serrated than those from the plains, from whence they were introduced not many years since; they have also a darkish band along the side'. Walker[2] (p. 17) gave the following list of the Naini Tal fishes, based on identifications made by the Curator, Indian Museum, Calcutta:—

(1) *Barbus tor* (Mahseer).
(2) *Barbus chilinoides* (the lake fish) or 'Kali Macchi'.
(3) *Barbus conchonius*.
(4) *Barilius bola* (Hill trout).
(5) *Ophicephalus gachua* (Murrel).
(6) *Oreinus sinuatus* (Risala).

For introducing Mahseer in the lakes, Walker (p. 103) pays a well-deserved tribute to Sir Henry Ramsay and narrates the following history of their introduction here:—

'The public are indebted to Sir Henry Ramsay for the mahsir fishing in the Kumaon lakes. On account of the steep falls at or below the outlets of all the lakes, except Malwa-tal, no mahsir could possibly have got unaided into them. Into Malwa-tal it is possible that fish could get at most seasons from the Gola river.

'About 30 years ago Sir H. Ramsay had some small mahsir carried up from the Gola in earthen-ware *Ghurras* to stock Bhim-tal, Naukuchia, and Sat-tal, and from the Kosi river to stock Nainital.

'These young fish prospered in Naini-tal, in Sath-tal and in Naukuchia, but they failed in Bhim-tal. For upto 1873 I never saw nor heard of a mahseer being caught in Bhim-tal.

'Later however (I think in 1878), Sir H. Ramsay again made an effort to introduce mahsir into Bhim-tal, and this time with success. The fish are now flourishing in Bhim-tal, as well as in many of the other lakes. I have myself caught mahsir in Bhim-tal, weighing 8 lbs, and I am aware of one having been caught on a live-bait, which weighed 18 lbs.'

---

[1] Day, F., Fish. India, p. 576 (1878).
[2] Walker, W., Angling in the Kumaon Lakes, p. 103 (1888).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

'As regards "Kali-macchi"—"Lake fish or Kurnkutla", I cannot get information of any period at which they did not exist in the lakes, but whether they were introduced in pre-historic times or like Topsy "growed" there, I cannot say'.

I have quoted extensively from Walker's, 'Angling in the Kumaon Lakes' for two reasons, firstly this work is not available in any of the research libraries and secondly these facts are of great historic importance in the study of the Kumaon fishes.

The next record of fish from the Kumaon Lakes is by Sundara Raj[1] who stated:—

'From all reports these isolated lakes had hardly any fish in them before the introduction of Mahseer by Sir Henry Ramsay, a well-known commissioner of Almora from 1856-84. The comparative barrenness of waters at this elevation is a characteristic feature of the Indian hills'.

'The only other fishes found in these lakes at present are:—

(1) *Barbus* (*Tor*) *cheilinoides* McClelland.
(2) *Barbus* (*Puntius*) *conchonius* Hamilton.
(3) *Raiamas bola* (Hamilton).
(4) *Barilius bendelisis* (Hamilton).
(5) *Oreinus sinuatus* (Heckel).
(6) *Nemachilus rupicola* (McClelland).
(7) *Ophicephalus gachua* (Hamilton)'.

In May-June 1948 a party of the Zoological Survey of India surveyed the fauna of a part of the Kumaon Hills and made extensive collections in the Naukuchia, Bhim-tal, and several rivers and streams and casual collection in the Sath-tal and Naini-tal. Over a thousand specimens were collected. In the lakes, besides the Mahaseer, *Barbus* (*Tor*) *putitora* (Hamilton), the following other species were obtained:—

Barbus (*Puntius*) *ticto* (Hamilton).
Barilius bendelisis (Hamilton).
Oreinus plagiostomus (Heckel).
Ophicephalus gachua Hamilton.

It is inferred, therefore, that *Barbus* (*Tor*) *cheilinoides*, *Barbus* (*Puntius*) *conchonius* and *Raiamas bola* of the earlier lists are either now absent from the lakes or are very rare and that *Barilius bendelisis*, and *Barbus* (*Puntius*) *ticto* have been recently introduced into the lakes. The explanation of the absence of certain fish earlier known from the lakes is to be found in the habits and associations of some of these fishes. Walker (p. 35), giving his experience of fishing in the Naini-tal, stated:—

'When I first angled in Naini lake, in 1863 and 1864, there were comparatively few large mahsir in it, there were shoals of lake fish (*Barbus chilinoides*) and many small trout (*Barilius bola*). A mornings catch would include a couple of small mahsir, eight or nine 'lake fish' and two or three trout. Gradually the mahsir have reduced the number of other fish until it is a rare circumstance to catch a lake-fish with the fly, and I have not for many years seen a single trout, although I heard of one being caught last year by a troller'.

[1] Raj, Sundara B., *Proc. Nat. Inst. Sci. India*, xi, pp. 341-342, 346.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Besides the ravages of the predatory mahseer, he attributed the disappearance of the trout from the lake to its breeding habits. He stated (p. 37):—

'I have written only of the Mahasir in the Naini lake because they now reign supreme having practically as far as fly-fishing is concerned, cleared out every other kind of fish. The instinct of the trout, which led it in autumn to crowd round the mouth of the streams which enters the lake at its western end, accelerated its disappearance: for I have in former years often seen the natives lifting them out with sheets in thousands as they pressed on each other in their anxiety to get up stream. The persistence with which this instinct remained in the Baril is in strange contrast to the complete annihilation of the migratory tendency in the lake mahsir'.

Again in his account of the Bhim-tal, Walker (p. 52) stated that 'without doubt the mahsir have lessened the numbers of the lake fish; but there is as little doubt that the protection of the fish from poachers is too intermittent to secure the interests of the honest angler'.

Leaving aside the fish fauna of the lakes, which appear to have been artificially stocked at one time or another, the first account of the fish of the Kumaon Himalayas is given by Hora[1]. The material on which this account is based was obtained by Messrs. E. O. Shebbeare and M. P. Bhola from the Nandhaur and Kalaunia rivers, which were not visited by us. It comprised 17 species, of which 11 are represented in the collections made from the Kosi and Gola rivers. The following species are not represented in the present collection:—

(1) *Brachydanio rerio* (Hamilton).
(2) *Barbus chilinoides* McClell.
(3) *Barbus conchonius* (Hamilton).
(4) *Lepidocephalus guntea* (Hamilton).
(5) *Glyptothorax pectinopterus* (McClell.).
(6) *Amblyceps mangois* (Hamilton).

The following species found in the present collection were not represented in the collection from the Nandhaur and Kalaunia rivers:—

(1) *Oreinus plagiostomus* (Heckel).
(2) *Labeo dyocheilus* (McClell.).
(3) *Barbus* (*Puntius*) *ticto* (Hamilton).
(4) *Nemachilus rupicola* (McClell.).
(5) *Botia almorhae* Gray.

Taking the lakes and the streams of the Kumaon Hills together, it would appear that 23 species have been recorded so far, of which one, *Raiamas bola* (Indian Trout) has not been found in recent years and many have died out altogether. The fish fauna as now known, is listed below:—

---

[1] Hora, S. L., *Rec. Ind. Mus.* xxxix, pp. 338-348 (1937).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LIST OF FISHES KNOWN FROM THE KUMAON HIMALAYAS

Scientific Name and Systematic Position of Species	Reference	Number, Size and Locality of Specimens in the Recent Collection	Distribution
Cyprinidae			
Sub fam. Rasborinæ			
1. *Barilius bendelisis* (Ham.)	Day, *Fish. India*, p. 590, pl. cxlviii, Figs. 7, 8, 9 (1878).	60 specimens: 6 to 14·4 cm. Naini-tal stream, Bhim-tal and Kosi river (Khairna).	Along the base of the Himalayas and throughout the contiuent.
2. **Barilius* (*Raiamas*) *bola* Ham.	Hora, *Rec. Ind. Mus.* xxxviii, p. 138 (1936).	...	Hilly parts of Punjab, U. P., Orissa, Assam, Bengal and Burma.
3. *Barilius vagra* (Ham.)...	Day, *Fish. India*, p. 598, pl. cxviii, Fig. 3 (1878).	13 specimens: 2·6 to 9·7 cm. Kosi River (Khairna).	Rivers of Himalayas, Assam and Sind Hills.
4. **Brachydanio rerio* (Ham.)	Hora, *Rec. Ind. Mus.* xl, p. 173 (1938).	...	Throughout India and Burma.
Sub fam. Cyprininæ			
5. **Barbus* (*Puntius*) *chilinoides* McClell. ...	Day, *F.B.I.* p. 307 (1889).	...	Along the Himalayas upto Assam and Ganges.
6. **Barbus* (*Puntius*) *conchonius* (Ham.)	Hora, Misra & Malik, *Rec. Ind Mus.* xli, p. 278 (1936).	...	Deccan, N. W. Provinces, Punjab, Bengal and Assam.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

7. *Barbus* (*Puntius*) *ticto* (Ham.)	Hora, Misra and Malik, *Rec. Ind. Mus.* xli, pp. 263–297 (1939).	220 specimens: largest 6·8 cm. Naukuchya-tal, Bhim-tal; Naini-tal and Kosi rivers.	India, Burma and Siam; very widely distributed.
8. *Barbus* (*Tor*) *putitora* (Ham.)	Hora, *Journ. Bombay Nat. Hist. Soc.* xli, pp. 277–284 (1939).	100 specimens: largest 1½ ft Naukuchya-tal, Bhim-tal Sat-tal and Kosi river.	All along the Himalayas.
9. *Crossochilus latius* (Ham.)	Mukerji, *Journ. Bombay Nat. Hist. Soc.* xxxvii, p. 50 (1934).	5 specimens: largest 19 cm. Kosi river (Khairna).	Peninsular India, along the Himalayas and Burma.
10. *Garra gotyla* (Gray) ...	Hora, *Rec. Ind. Mus.* xxii, p. 653 (1921).	3 specimens: 15 cm. each. Kosi river (Khairna).	All along the base of the Himalayas.
11. *Garra prashadi* Hora ...	Hora, *Rec. Ind. Mus.* xxxix, pp. 338–340 (1937).	4 specimens: largest 12 cm. Kosi river (Khairna).	Endemic in the Kumaon Hills.
12. *Labeo dero* (Ham.) ...	Hora, *Rec. Ind. Mus.* xxxviii, pp. 314–315 (1936).	8 specimens: largest 25 cm. Kosi river (Khairna).	All along the Himalayas, Sind Hills, Assam, Burma and Ceylon.
13. *Labeo dyocheilus* McClell.	Hora, *Rec. Ind. Mus.* xxxviii, pp. 320–321 (1936).	2 specimens: 18 and 31 cm. Kosi river (Khairna).	All along the Himalayas, and Sind Hills.
14. *Oreinus plagiostomus* (Heck.)	Misra, *J. Zool. Soc. India*, I, pp. 39, 40 (1948).	80 specimens: largest 72 cm. Kosi river (Khairna) Naini-tal lake and Bhowali Nalla.	Afghanistan and Kashmir.
COBITIDAE			
15. *Botia almorhae* (Gray)...	Hora, *Rec. Ind. Mus.* xxiv, pp. 320–321 (1922).	3 specimens: largest 15·1 cm. Kosi river, Almorha.	Khasia and Almorha Hills.
16. **Lepidocephalus guntea* (Ham.).	Hora, *Rec. Ind. Mus.* xl, p. 177 (1938).	...	Throughout northern India.
17. *Nemachilus beavani* Gunth.	Hora, *Rec. Ind. Mus.* xxxix, p. 341 (1937).	47 specimens: 2 to 7.7 cm. Kosi and Gola rivers.	All along the eastern.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

LIST OF FISHES KNOWN FROM THE KUMAON HIMALAYAS—(*Continued*)

Scientific Name and Systematic Positon of Species	Reference	Number, size and locality of specimens in the recent collection	Distribution
COBITIDAE—(*continued*)			
18. *Nemachilus botia* (Ham.)	Mukerji, *Journ. Bombay Nat. Hist. Soc.* xxxvii, p. 39 (1934).	19 specimens : 3 to 8 cm. Kosi river and Ramgar nalla, (Ramgar).	All over northern India and Burma.
19. *Nemachilus rupicola* (McClell).	Day, *Fish. India*, p. 616, pl. clv, Fig. 9 (1878).	100 specimens : 3 to 8·4 cm. Bhowali nalla, Ramgar nalla, Naini-tal stream, Gola and Kosi rivers.	Simla to Naga Hills along the Himalayas.
SISORIDAE			
20. **Glyptothorax pectinopterus* (McClell.)	Hora, *Rec. Ind. Mus.* xxv, pp. 18, 19 (1923).	...	Simla, Kangra and Dehra Dun Hills.
AMBLYCEPIDAE			
21. **Amblyceps mangois* (Ham.)	Hora, *Rec. Ind. Mus.* xl, pp. 178, 179 (1938).	...	All along the Himalayas as far as Assam and Burma.
OPHICEPHALIDAE			
22. *Ophicephalus gachua* Ham.	Hora & Mukerji, *Rec. Ind. Mus.* xxxvii, p. 404 (1935).	11 specimens : largest 15 cm. Bhim-tal and Kosi river.	Throughout India, Burma and Andamans.
MASTACEMBILIDAE			
23. *Mastacemblus armatus* (Lacep.)	Day, *Fish. India*, p. 340, pl. lxxiii, Fig. 2 (1878).	16 specimens : 6 to 14·6 cm. Kosi river (Almorha).	Throughout the plains and hill of India, Burma and Ceylon.

Specimens marked with an asterisk are not represented in the collection under report, but were recorded and described from the Kumaon Hills by Hora in the year 1937 (*Rec. Ind. Mus.* xxxix, pp. 338–48).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTES ON CERTAIN SPECIES

Garra gotyla (Gray).

1921. *Garra gotyla,* Hora, *Rec. Ind. Mus.* xxii, p. 553.

Three specimens of *Garra gotyla,* approximately 15 cms. each, were collected from the Kosi river. They were compared with the specimens in the collections of the Zoological Survey of India, and, as had already been pointed out by Hora, marked differences in the shape of the head and proboscis could be discernible between the Western and the Eastern Himalayan forms. Local variations also were noticed in this species. The specimens under report, for instance, differ considerably in the shape of the head and proboscis from those obtained from Kangra (Punjab) and Dehra-Dun. In the accompanying figure these differences are clearly shown.

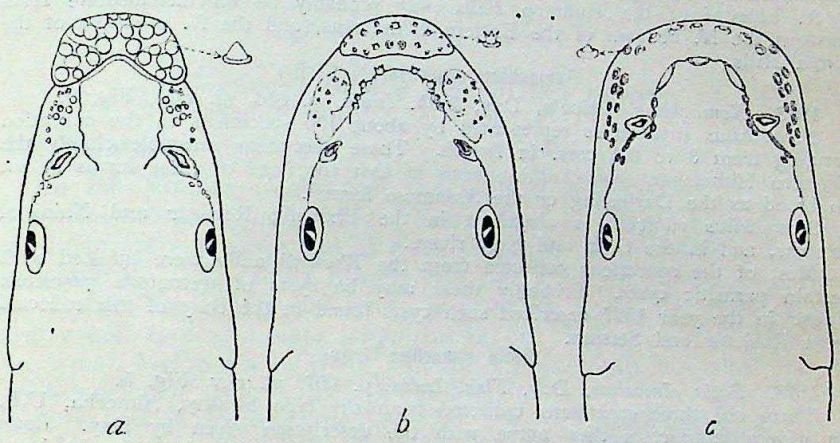


Fig. 1.—Outline sketches of head of 3 specimens of *Garra gotyla.* (*a*) from Dehra Dun, (*b*) from Kumaon, (*c*) from Kangra.

Garra prashadi Hora.

1937. *Garra prashadi,* Hora, *Rec. Ind. Mus.* xxxix, pp. 338-40.

There are four female specimens of *Garra prashadi,* in the collection under report. In all the important characteristics they agree with the typical specimens, but the head is not so bluntly pointed. The body is sub-cylindrical with slightly bulged out thoracic region. The dorsal profile rises very gently from the tip of the snout to the base of the dorsal fin. The dark spot behind the angle of the operculum, which is characteristic of *Garra prashadi,* is absent in these specimens.

Three small specimens of this species were first collected from Malva Tal, U.P., in May 1920 by Drs. B. Prashad and S. L. Hora. The second lot of about 77 specimens was collected from the rivers of Nandhaur and Kalaunia, U.P., in May-June 1936.

As this species has not been recorded from any other locality except the Kumaon Hills the exact limits of its distribution cannot be stated until an extensive survey of the Western Himalayan region is made.

Oreinus plagiostomus (Heck.)

1889. *Oreinus sinuatus,* Day, *F.B.I.* I. p. 248.
1889. *Oreinus plagiostomus,* Day, *F.B.I.* I. p. 250.
1949. *Oreinus plagiostomus,* Misra, *J. Zool. Soc. India,* I, pp. 39, 40.

Oreinus plagiostomus is represented by 80 specimens in the collection under report. They were collected mainly from the Kosi river, the Naini Tal lake and the Bhowali nalla. All the specimens, except one about 27 cms. in length, are immature individuals under 3 cms. in length. It would thus appear that the species breeds in April-May so far as this region is concerned.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

According to Misra, *O. plagiostomus* and *O. sinuatus* are conspecific and they represent the male and the female respectively of one and the same species.

Nemachilus beavani Günther.

1937. *Nemachilus beavani*, Hora, *Rec. Ind. Mus.* xxxix, p. 341.

Nemachilus beavani is represented by 47 specimens in the collection and they range from 2 cms. to 7.7 cms. in total length. They were collected from the Kosi and Gola rivers and resemble the Eastern Himalayan examples in all important diagnostic features, except in one, that is, in the number of the vertical brown bands on the body. There are in these specimens from 10 to 12 vertical brown bands on the body which is a characteristic feature of *N. montana*. There is also a slight dorso-ventral depression of the body and head discernible in these specimens which again is a character of the *montana* species.

N. beavani of the Kumaon Hills may probably be an intermediate form between the *N. beavani* of the Eastern Himalayas, and the *N. montana* of the Simla Hills.

Nemachilus rupicola (McClell.)

1878. *Nemachilus rupicola*, Day, *Fish. India*, p. 616, pl. cliii, Fig. 9.

Nemachilus rupicola is represented by about 100 specimens in the collection ranging from 3 to 8.4 cms. in length. These specimens resemble closely the Western Himalayan race of the species in that the head of these forms is not so broad as the Darjeeling or the Assamese forms[1].

Nemachilus rupicola is abundant in the Bhowali, Ramgar and Naini-tal streams, and in the Gola and Kosi rivers.

Most of the specimens collected from the Bhowali naila were infested with certain parasitic cysts. Probably these may be cysts of trematode parasites. Faust[2] in the year 1927 described such cysts found in the body of fish collected from Kashmir and Seistan.

Botia almorhae Gray

1878. *Botia almorhae*, Day, *Fish. India*, p. 607, pl. cliv, Fig. 5.

There are three specimens collected from the type locality, Almorha, U.P. In general characters they agree with the description given by Day. *Botia almorhae* can be easily distinguished from other species of *Botia* by its long, bifid sub-orbital spine which extends to the hinder end of the orbit.

I give below a table of measurements of the three specimens for convenience of reference in future.

MEASUREMENTS IN MILLIMETRES

Length of the body including caudal	...	151·2	133·1	142·9
Length of the head	...	33·1	28·5	29
Height of the head	..	22·5	23	22
Breadth of the head	...	12·1	12	13·2
Depth of the body	...	31·1	27·2	27·5
Length of the snout	...	18	16·2	17
Diameter of the eye	...	4	3·8	3·9
Inter-orbital width	...	7·9	7·7	7·8
Height of the dorsal fin	...	23	19·2	23
Length of the pectoral fin	...	25·5	21	25
,, ,, ,, ventral ,,	...	21	18	19·5
,, ,, ,, anal ,,	...	25	20·5	23
,, ,, ,, caudal ,,	...	32·5	30	32
,, ,, ,, caudal peduncle	...	15·5	13	15·75

ACKNOWLEDGEMENTS

I wish to express here, on behalf of the survey party, our sincerest thanks to Mr. Smetacek of Naukuchiya Tal for all the help that he rendered to us and made our stay there pleasant. I am also deeply indebted to Dr. S. L. Hora, Director of the Zoological Survey of India for all the valuable suggestions and guidance that he very kindly gave me in writing out this paper.

[1] Hora, S. L. and Mukerji, D. D., *Rec. Ind. Mus.* xxxvii, p. 400 (1935).
[2] Faust, E. C., *Rec. Ind. Mus.* xxix, p. 218 (1927).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE STUDY OF INDIAN MOLLUSCS

BY

JAMES HORNELL, F.L.S., F.R.A.I. (Deceased)

PART II

(*With 23 text figures*)

(*Continued from p. 334 of this volume*)

The Volutes

In the Volutes (Volutidae) the shell is generally large and of beautiful colouring and shape. The animal is often larger than its shell can accommodate and as a consequence the operculum in these is wanting. The radula usually has but a single longitudinal row of teeth. The family has great interest for India, for besides the pretty and typical *Voluta lapponica* of our Indian seas, it includes the great Melon-Shell (*Melo indica*). In its youth this shell has a well-developed spire as in ordinary Volutes; with growth the body of the animal increases so fast and thus the mouth whorl becomes so inflated and overgrown that the spire is eventually hidden. Strong folds are present on the columella. The adult shell is almost globular with the mouth whorl so inflated that in New Guinea a closely related species is commonly used by fishermen as a bailer. Our Indian Melon-shell grows to a length of about eight inches. It is fairly numerous in five to six fathoms depth in Palk Bay, less numerous elsewhere. It appears therefore to prefer a bottom where a considerable amount of mud is present in the sand. The shell is pale reddish brown blotched with a darker shade. The animal—foot, mantle and head—is striped like a tiger with yellow and black. When crawling it presents a remarkable appearance, the shell all but lost to sight in the enwrapping folds of the gorgeous mantle and foot.

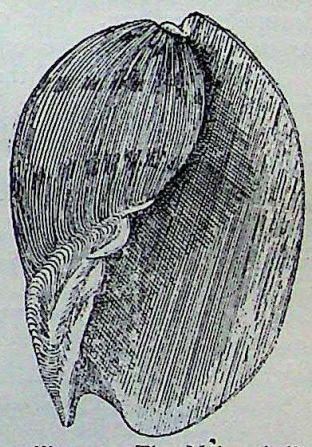


Fig. 29.—The Melon-shell, *Melo indica* Gmelin. ×⅓.

The eggs are deposited in an extraordinary egg-mass—one of the strangest produced in these seas. It stands nearly a foot high, a great honeycomb-like glassy cylinder made up of some hundreds of clustered capsules, each nearly an inch in length. In form and sculpture it resembles a tall cylindrical pineapple, the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

capsules representing the bracts. A narrow cavity perforates the centre of the cylinder. The walls of the different capsules are tough, colourless and hyaline. As in the Chank a number of ova are deposited in each capsule, but with growth all disappear eventually but one, and this, when it frees itself by eating through the capsule wall, is nearly an inch in length. Long before they emerge, the young may be seen clearly through the transparent walls. The spire at this time is distinctly conical, and the whole shell extremely like that of the land-snails *Bulimus* and *Achatina*. A curious fact is that this giant egg-mass is not implanted in the sand as in the case of the chank; the parent carries the great mass with her until the young become free.

The Olives

The family of the Olives (Olividae) contains some of the commonest shells found on the east coast of India; on the west coast they are comparatively scarce. They are notable for their high polish and the beauty of their marbled colouring. Among themselves there is less difference in form than usual, the shape being roughly cylindrical, with a very short pyramidal spire and a long narrow mouth opening. The suture between the whorls is channelled and is in connection with the hinder end of the mouth aperture by way of a narrow slit in the lip through which a thread-like tactile process of the mantle passes, to lie when at rest in the channelled suture. The columella is overlaid with deposit and is striated obliquely. No operculum is present.

As in *Natica*, where the habit of life is similar, the shell is partly immersed in the swollen foot; the mantle lobes are also large and meet over the back thereby ensuring the maintenance of the high polish of the shell.

The Olives are very active; they burrow rapidly in wet sand in quest of the bivalves on which they feed and it is said that they may even be taken on a line baited with a fragment of flesh.

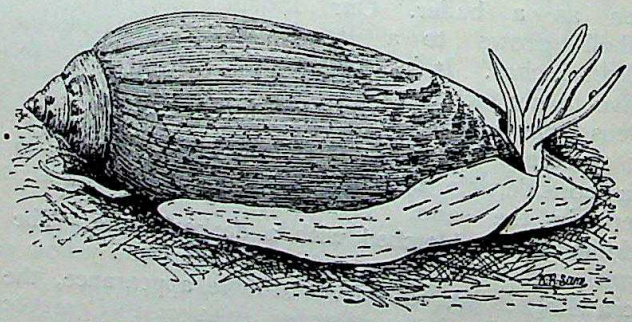


Fig. 30.—*Oliva gibbosa* Born., seen in crawling attitude. × 1½.

The common species is *Oliva gibbosa*. *O. ispidula* and *O. oliva*, together with the related *Ancilla cinnamomea*, are other less common forms. As a rule the species of *Ancilla* are of one uniform colour whereas those of *Oliva* are coloured variously with blotches,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

spots and marblings. *O. nebulosa* is exceedingly common around Bombay.

On the Coromandel coast Olives are extensively used as food by the Pattanavar or sea-fishermen caste. The chief collecting season is during spring tides during the fine weather period from February to April. Towards the end of the ebb Pattanavar women and lads search for them in shallow water by turning the sand over with their feet or, in the case of those in uncovered sand by marking the trails as the Olives travel about. The women boil their catch in fresh water, extract the flesh and then either use it in their curry or fry it in oil.

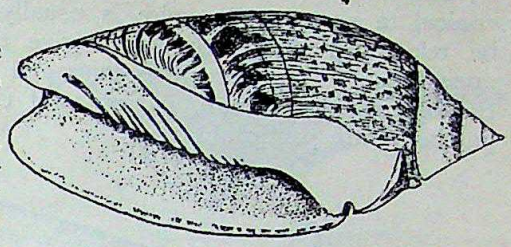


Fig. 31.—*Ancilla cinnamomea* Lam.

The Marginellidae are small shells akin in appearance and anatomy to the Olives; *Marginella angustata* is sometimes mistaken for a small Olive. A distinguishing character is the great thickening of the outer lip.

The Harp-shells

The last family of importance among the Rhachiglossa is that of the Harp-shells (Harpidae), a small group of very beautifully coloured shells, the polished surface adorned with prominent longitudinal ribs, suggesting the strings of a harp. The body whorl is greatly inflated (ventricose) as in *Tonna*, the spire short and the columella smooth and covered with a brilliant callus. The foot is enormous, with a semilunar fore-part separated by a transverse groove; no operculum.

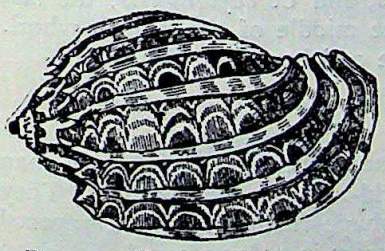


Fig. 32.—*Harpa ventricosa* Lam. ×½.

As is usual in highly polished shells the mantle is reflected over the back; this protects it from attrition, and damage. The only living specimens that I have found in India were in coral-reef pools in the Gulf of Mannar and in the Laccadive Islands. When irritated, *Harpa ventricosa*, our common local species, commits self-mutilation by severing and throwing off the hinder part of the great foot whenever alarmed, in frequently successful endeavour to escape.

Tribe 2.—Toxoglossa

The next three families, the Turridae, Terebridae and Conidae, possess a large 'poison gland' in the gullet, communicating by a duct with barbed teeth on the radula; they constitute the tribe of 'Poison-teeth' or *Toxoglossa*. As may be inferred from this, they are carnivorous in habit.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The Cones

The Cones (Conidae), as their name implies, are more or less conical in shape. The spire is usually very short and may even be telescoped so greatly as to give the apical end a truncated appearance. The aperture is long and narrow, the outer lip thin; the operculum is small, narrow and claw-shaped. Internally the partitions are partly absorbed.

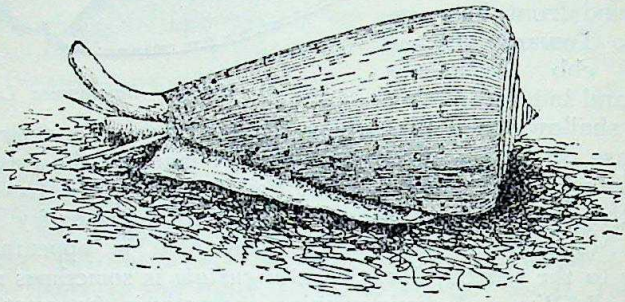


Fig. 33.—Life appearance of *Conus monile* Brug. ×1.

The family is very numerous in species, mainly tropical in habitat; it includes many most brilliantly coloured shells, some so rare and beautiful that collectors have paid as much as Rs. 750 for a single shell. Some species are dangerous to handle on account of the poisonous nature of their bite; none of our fishermen appear to fear them; the South Sea Islanders on the contrary have a most lively dread of them, and allege that their bite is liable to prove fatal!

Our common species chiefly haunt coral reefs. They include *Conus ebraeus* (the marking resembling Hebrew letters). *C. figulinus, C. litteratus, C. geographus,* and *C. ceylanensis,* the last with a characteristic white band in the middle of the mouth whorl. *C. textile* is a magnificent shell, large and beautifully polished.

The Slit-lips

The Slit-lips (Turridae) are even more numerous in species than the Cones and, unlike them, are world-wide in distribution. They are nearly all very small in size; in shape fusiform with a tapered spire and an elongated body-whorl ending in a long canal. A deep slit or notch in the thin lip close to the suture is their characteristic feature. Our common species are *Turris indica* and *T. acuta.*

The Augers

Lastly we have the Auger-shells (Terebridae), very long tapered shells of many whorls, resembling in general form the Turret-shells (*Turritella*) but stouter and, instead of the shells being sculptured into spiral ridges, they are generally smooth surfaced or noduled and brightly ornamented with coloured spots—commonly with orange on a white ground. *Terebra duplicata* is not uncommon

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in moderate depths on sandy bottom around the mainland coasts. In the Laccadives they seem much more numerous; from one short visit examples of five species were brought back including *T. maculata*, and *T. crenulata*.

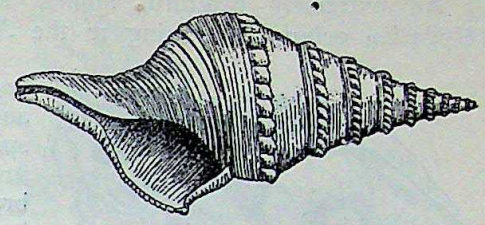


Fig. 34.—*Surcula javana* L.

Sub-class II.—*EUTHYNEURA*

The Gastropods belonging to this group have the visceral nerve straight and not twisted as in the Streptoneura with which we have just dealt. Another characteristic is the excessive development of the sides of the foot into lateral folds or epipoda. These tend to envelop the shell and in degree as this is more complete and permanent, so the spiral form of the shell is reduced and its substance lessened in thickness, till it eventually becomes lost. In the most specialized in this direction, the torsion or twisting of the body tends to disappear and the animals gradually acquire a *secondary* external symmetry. The group is divided primarily into the orders Opisthobranchia and Pulmonata, the former marine, with breathing arrangements suitable for life in water; the latter without gills and normally air-breathers.

ORDER I.—OPISTHOBRANCHIA

This order includes the Bubble-shells (Bullidae), the Sea-Hares (Aplysiidae), the Umbrella-shells (Umbraculidae), one section of the Pteropods and the large and interesting shell-less group of the Nudibranchs.

The Bubble-shells

The Bubble-shells (Bullidae) are abundant on sandy bottom in shallow water. The swollen oval shells of *Bulla ampulla*, seemingly all 'mouth', mottled with pale transparent brownish-red, are often thrown ashore on our sandy beaches. In life none of the shell is seen, the fleshy lobes of the foot being reflected over the shell both at the sides and behind. In front the foot, as in many other burrowing mollucs, *Natica* and *Oliva* for example, forms a stout head-shield—the equivalent in its economy of a ploughshare.

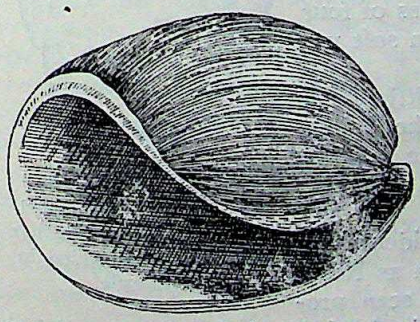


Fig. 35.—Bubble-shells (*Bulla ampulla* L.).

A closely allied species is the little *Cylichna cylindracea*, belonging to the family Scaphandridae, often found in the neighbourhood of Bombay. Its shell is cylindrical with a long and narrow opening; it is not unlike a young Olive. The Scaphanders live upon other shellfish but instead of boring a hole in the victim's shell, in

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

order to suck out contents, they swallow their prey whole, grinding it up, shell and all, within a powerful gizzard.

An extremely beautiful animal is the Striped Bubble-shell (*Hydatina velum*), belonging to the Aplustridae. (Fig. 36.)

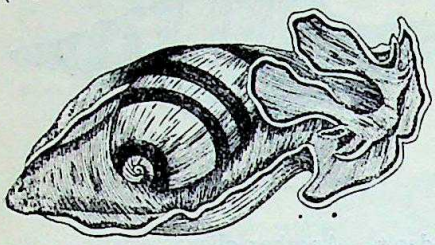


Fig. 36.—Life appearance of *Hydatina velum* Gmelin. ×1.

The shell has the form of *Bulla* but is thin and fragile and ornamented with broad spiral black bands on a pale ground. The foot is very broad; the head disc extremely large. The true tentacles (there are four labial ones) are wide and ear-shaped and of enormous comparative size. The colouring of the foot and tentacles partakes of the colour scheme of the shell; it is a wonderful sight to see this creature when crawling in a pool, the shell partly uncovered, the great head with its elephant-ear tentacles stretched forwards and the wide side-folds partly reflected, undulating gracefully over roughnesses of the ground.

The Philines

In the Philinidae the form of the body is fully specialized for burrowing. The shell has become thin and small, the spire almost lost and the aperture wide and ear-shaped; it is embedded entirely and there is therefore no longer a clumsy projecting mass on the back as in *Natica* and *Oliva* and *Bulla* to hinder easy progress through sand. The lobes of the body are fleshy and smooth, without projections, the whole an animated ploughshare, perfect for the purpose of burrowing rapidly. Like *Bulla* and *Cylichna* it has a powerful gizzard armed with a crushing apparatus composed of three shelly plates. The common Indian species of *Philine* is shapeless in appearance, a mere mass of four fleshy lobes. It is not uncommon in soft wet sand.

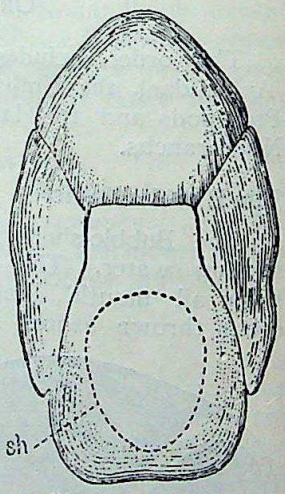


Fig. 37.—Living appearance of *Philine*, dorsal view; the dotted line outlines the position of the shell embedded in the mantle.

Very different is the beautiful little *Lobiger* of the family Oxynoidae. The Indian species, *Lobiger nevilli*, is often seen in great abundance in quiet, sheltered bays wherever sea-grass prairies are to be found. At first sight the observer is inclined to identify it as one of the naked forms known as Nudibranchs until the rounded shell is seen protruding from the back. The body is slender and slug-like, tapering off behind into a long, narrow pointed tail. The head bears two short, flattened tentacles, while on each side of the body proper, rise upwards two pairs of great leaf-like lobes or fins, whereof the anterior pair is slightly the smaller. Each of these four fins is a

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

thin, wide lobe with frilled edges, attached to the body by a muscular stalk. When alarmed or disturbed the animal seeks to escape

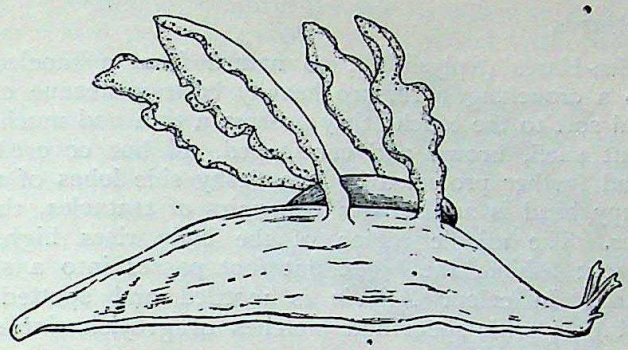


Fig. 38.—*Lobiger nevilli* Pilsbry, showing the oval shell lying between the two pairs of fins. ×2.

by throwing off its fins; when cast off, these exhibit slight movements for some time after. With the help of its mobile tail and of these paired fins *Lobiger* is enabled to swim with ease. The oval shell, slightly convoluted, is transparent and very delicate; its convex surface is freely exposed on the middle of the back, between the fins; there is here no need as in *Bulla* and *Philine* to protect it from sand attrition, for *Lobiger* pursues a free life in the sea, never attempting to burrow. The body-colour of our only Indian species is normally a brilliant green, harmonizing with the colour of the sea-grass of the shallows where it abounds. Sometimes minute dark specks are scattered through the green. The fins are of a similar green colour but each is bordered with a band of coral red speckled with black dots. *Lobiger* appears to posses some power of colour adaptation, for when placed in a white vessel it becomes yellow, the lovely scarlet border to the fins disappearing in the effort to assimilate its colouring to the environment.

Sea-Butterflies

Here are placed by several eminent systematists the shell-bearing Pteropods, 'Butterflies of the Sea' as they are often termed. They spend their whole life in the open sea and though the number of their species is small, individually they often occur in such vast swarms as to discolour the water for miles; they form the principal food of the Baleen Whales. Their shells are either tubular (*Creseis*) or broad and pocket-shaped (*Cavolina*); those of the former are often abundant in the plankton of our waters but so small, pellucid and needle-like as make them difficult to be recognized except when examining under a microscope the catch of minute floating oceanic life made by a tow-net. The shell of *Cavolina* on the contrary is horny and brown and sufficiently stout to be easily identified when thrown ashore after storms, usually in company with *Ianthina* and violet-coloured siphonophore jellyfishes.

The Pteropods differ from other molluscs in the transformation of the foot into a pair of great wing-like swimming fins, arranged

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

one on either side of the mouth, the head as a distinct organ having virtually disappeared.

The Sea-Hares

The Sea-Hares (Aplysiidae), so named from a fancied resemblance to a crouching hare, are heavily built grotesque creatures, lumpy and soft to the touch; they possess a thin and much reduced transparent shell, brown and ear-shaped, all but covered by the mantle and further protected by two fleshy side lobes of the foot. The stumpy head is armed with two pairs of tentacles, the hinder the larger. The middle region of the body rises high with a humpy back; behind, the broad flat foot passes into a short but distinct tail. In colour *Aplysia* is mottled and spotted a dirty purplish brown with spots and blotches of greyish tint scattered throughout.

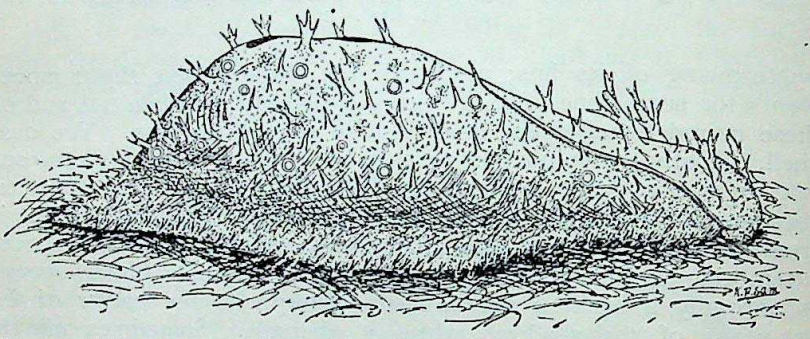


Fig. 39.—Life appearance of the Plumed Sea-hare (*Notarchus*), from Ennur backwater, Madras.

Species of *Aplysia* are common in most parts of the world; the common Indian one is almost indistinguishable from the British, and is equally abundant in weedy shallows in bays and the seaward ends of backwaters. These molluscs vary greatly in abundance from year to year; sometimes they appear along the margin of the sea in multitudes; in other years scarcely one is to be found at the same season. When handled they discharge a large quantity of purple fluid from glands under the mantle. This secretion is harmless but is undoubtedly protective for it discolours the water for a considerable distance around, alarming to any fish with predatory intent. The odour is also unpleasant and to some persons is distinctly nauseous.

Aplysia deposits its ova in long, greatly tangled cords, of considerable total bulk, the colour brownish pink. In India the spawning season is February and March. At this time the animals are notably gregarious. Another notable Indian genus is *Dolabella*.

Yet another genus closely related in form, size and colour is *Notarchus*, marked off sharply from *Aplysia* by the presence of long filaments, the larger dendritic, scattered thickly over the whole upper surface of the body. Whether this is in any way protective I do not know. The lateral flaps in this genus are united behind and not open as in *Aplysia*; leaving only a small aperture on the summit

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of the back. No shell is present, a stage further—the final one—in the process of the elimination of what had become a useless structure. Large and beautiful eye-like spots are scattered over the body, the centre peacock green, ringed round with pale orange; each is at least three millimetres in diameter.

The gelatinous egg-cords, filled with opaque dirty reddish ova are similar to those of *Aplysia*. The spawning time is the same and so is its habitat—wherever weedy shallows are to be found. It is very common in some years in the month of March.

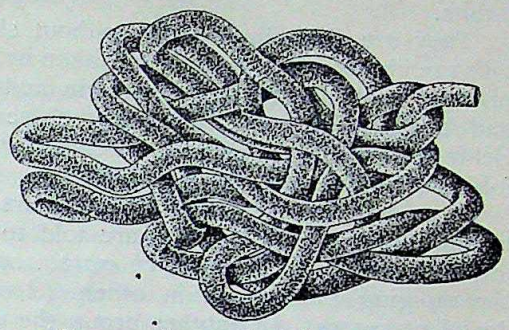


Fig. 40.—Egg cord of *Notarchus*. ×1.

The Umbrella-shells

The Umbrella-shell (Umbraculidae) is another clumsy creature of large size not uncommon in moderate depths on the east coast (probably just as common on the west coast wherever the habitat is suitable). It is easily recognized by the circular flat shell that partially covers the back of its ugly, tuberculated body, solid and muscular. The shell is quite uncovered and hides the large plumed gill lying beneath the mantle on the right side. The head is small and, like that of the tortoise, is retractile into a deep notch in the front of the enormously massive foot. *Umbraculum indicum*, with a shell often five inches in diameter, is our common Indian species.

Representative of the Pleurobranchidae is the dull, unsightly *Pleurobranchus*, coarsely slug-like in shape, greenish drab in colour and rough surfaced. It is often found in dirty muddy pools between tide-marks at Rameswaram and on the south shore of the Gulf of Kutch. The mantle extends over the back and entirely conceals the shell which is an oblong flexible horny plate, slightly convex. The head bears two pairs of short fleshy tentacles and, like Umbraculum, the foot gives off no lobes at the side as does Aplysia. As if its appearance were not sufficiently repulsive, spicules are developed within the mantle.

Naked-gilled Gastropods

Wherever wide expanses of bare sand prevail on the Indian littoral and in the adjacent shallows, the important sub-order of the Naked-gilled Gastropods—the Nudibranchia—are not well represented; their especial habitat is among weed-clad rocks washed by a strong tide-run. Rocky ground from Sind to Bombay and the Gulf of Mannar are their favoured haunts; here are to be found many and beautiful forms. Unfortunately they are the most difficult of all animals to preserve in their natural shape and colour, shrinking to uncouth lumps when killed unless infinite care be taken to

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

narcotize them; even so they have to be brought very gradually into the preservative fluid. To study them satisfactorily they must be examined in the living condition for at present we know almost nothing of the life appearance of many species and still less of their habits.

They are slug-like animals without shell of any sort. Internal gills are absent, their place being taken by outgrowths from the back, protean in the variety of their form and often exceedingly elegant and brightly coloured. In some, these form rosettes, in others richly arborescent filaments, or club-shaped knobs or even simple folds not unlike those of *Lobiger*.

In certain instances the vivid colours are assumed as warning colouration—possible enemies are told to beware of the calcareous spicules present in the skin of certain species (*Chromodoris*) or of the stinging cells which in others (*Aeolis*) are developed in the dorsal processes. In another group the colouring is protective and mimetic, harmonizing with that of the sea-weeds and animals amid which they live.

Retractile-gilled Nudibranchs

The commonest of Indian nudibranchs belong to the family *Dorididae*, distinguished by the presence of a rough, tuberculated dorsal shield, stiffened by the multitude of spicules embedded in it, and by the possession of external gills, usually pinnate or plumose, retractile within the orifice of the vent situated near the hinder end of the body. These retractile gills characterize the group of nudibranchs termed Anthobranchia. The most common Indian genus is *Glossodoris*. *G. petechialis* is abundant in the Gulf of Kutch, and the neighbourhood of Karachi, together with the related *C. semperi*. Another common Indian nudibranch is *Plocamopherus ceylonicus* belonging to the family Polyceridae, distinguished from the Dorididae by the gills or 'branchial tufts' being non-retractile and situated about the middle of the back.

Finger-gilled Nudibranchs

Interesting as these are, they cannot vie in beauty with the species belonging to the group of the Polybranchia where the gill filaments, resplendent in vivid hues, sprout from the sides of the body in all manner of variety. In some, as in the Aeolid *Pteraeolidia semperi*, the gill processes or *cerata* form a waving forest of long finger-like processes, brightly coloured.

An extremely peculiar and interesting creature is the soft, semi-gelatinous *Melibe rangi*, not uncommon on the pearl-banks of the Gulf of Mannar and under like conditions in the Gulf of Kutch. From the back of its slug-like body rise six or eight pairs of large semi-transparent lobes mottled olive green and brown; unlike the cerata of the Aeolids which are not voluntarily thrown off, those of *Melibe* drop off at a touch (caducous); when taken in a net they separate at once from the body and then become very puzzling to those who find them if they have no previous knowledge of the animal. Each lobe is somewhat flattened laterally and of crested wedge-shape. Over the whole surface are scattered irregularly

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

numerous tufted tubercles. Under the microscope each is resolved into a group of digitate papillae having colourless transparent walls containing threads of brown cell-rows. These threads belong to a lowly species of alga living in virtual partnership with its molluscan host—a most interesting instance of symbiosis.

Fold-gilled Nudibranchs

The last group of the Nudibranchs is a small one, that of the Pellibranchia; it is distinguished by the absence of external gills, their place being taken by a broad and sensitive fold on each side of the body. Through these ramify a system of blood vessels, thereby allowing respiration to be effected directly through the thin walls of the folds. These, beautifully margined by a border of contrasting colour, function also as swimming fins. The Indian representative of the group is *Elysia grandifolia,* of a brilliant green ground colour with the green fins bordered with a band of yellow, itself margined by a thin line of black.

Order II.—Pulmonata

With the exception of certain fresh-water forms which have re-acquired gill-like breathing organs, the Pulmonata are air-breathers in which the walls of the mantle cavity are traversed by a net-work of fine blood vessels, constituting a true lung. Their most familiar representatives are the land-snails and slugs, the former with a typical spiral shell; the latter, so far as India is concerned, have none externally but most of them possess a small internal plate or a few calcareous particles hidden beneath the skin of the back—vestiges of the ancestral shell.

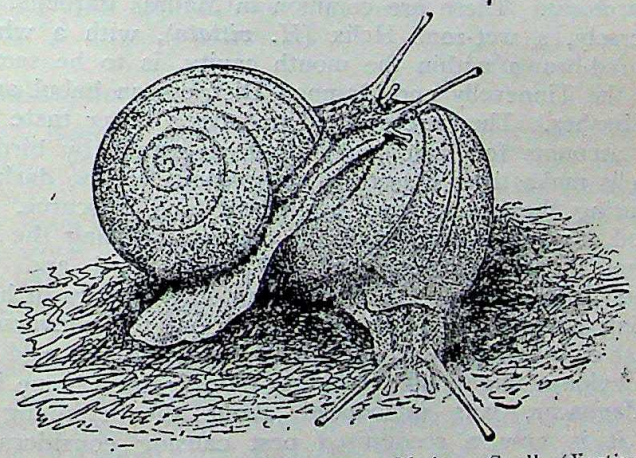


Fig. 41.—Two individuals of the Common Madras Snail (*Xestina bistrialis* Beck.).

In peninsular India two distinct land-snail areas exist, the one, the dry zone extending over the eastern and south-eastern regions—the other, the wet zone, comprising the ghaut region of the west—the Bombay Presidency, Malabar, Cochin and Travancore, together with the Anamalai, Nilgiri and Palni Hills. This wet zone has

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

intimate relationship with Ceylon: it is indeed classed as part of the Sinhalese Zoological Province by faunistic writers.

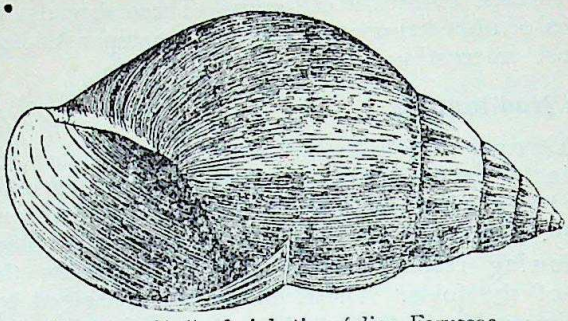


Fig. 42.—Shell of *Achatina fulica* Ferussac.

There is, however, much overlapping of these two regions and much intermingling of species. For example we are told that the Sinhalese province is characterized by the dominance and abundance of the genus *Helix*, while *Ariophanta*—which differs from *Helix* in having a mucus pore at the end of the tail—is considered to take its place very largely in the Indian dry zone. As a matter of fact Ariophantas are particularly abundant on the wet zone Anamalai and Nilgiri Hills and include the Imperial Snail, *Ariophanta basileus*, a magnificent species growing to 2½ inches in diameter, characteristic of the Cochin teak forests where it is occasionally eaten by the semi-wild tribes who live on forest produce; it is also found in the Anamalai and Nelliampathi Hills. Two smaller species are, however, abundant and characteristic of the dry zone area; one is the single-banded *Xestina ligulata*, the other the two-banded *Ariophanta biserialis*. These are common in Madras gardens.

Conversely, a wet-zone Helix (*H. vittata*), with a white shell coloured red-brown within the mouth cavity, is to be seen everywhere in the Tinnevelly and Ramnad Districts on babul and other dry-zone bushes. They are reputed to have a bitter taste and this probably accounts for their immunity from attack by birds; their white shells make them extremely conspicuous on the dark leafless thorns during the hot weather when bird food is scarce. During this period our Indian land snails lie dormant, closing the aperture of the shell by mucous secretion that dries hard and prevents evaporation from within. As this resting stage occurs in hot countries during summer it is termed aestivation, the converse of the winter rest or hibernation of animals in temperate and cold regions.

Into Ceylon a huge snail, *Achatina fulica*, whose home is Africa and Madagascar, was introduced about the beginning of this century; it is now a recognized pest causing considerable loss owing to its depredations in vegetable gardens in the low-country region. The shell is ovoid with a well-developed conical spire and it grows to a length of five inches. Its eggs are bright yellow and about one-tenth of an inch in diameter. Apart from Bengal where it has had a footing for over 80 years and where it is common in Calcutta gardens, it has failed to spread elsewhere in India (Fig. 42).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Stylommatophora

The shell-bearing pulmonates mentioned above belong to the section Stylommatophora, characterized by bearing eyes on the summits of the posterior of two pairs of invaginable tentacles. In the same section are located the true slugs belonging to the family *Limacidae*. In these naked slugs the body is elongated, narrowing behind into a pointed tail. The mantle is restricted to a shield-like area placed over the fore part of the body; beneath it is a small calcareous plate representing the shell. A large respiratory orifice opens on the right side rather far back. Several species of *Limax* are common in India, the majority limited to the wet-zone.

A remarkable genus of aberrant Pulmonates in that of the slug-like *Onchidium*, which frequents the sea-coast wherever there are brackish marshes and mangrove swamps. Unlike *Limax* the mantle covers the whole of the back and is covered with tubercles; a remarkable feature is that, in addition to the usual pair of tentacular eyes, a number of other eyes are developed upon certain of the tubercles on the back. They possess a lens, retinal nerve-end cells, retinal pigment and an optic nerve as do the tentacular eyes but, strangely enough the relationship of the nerve filaments to the retinal elements of the dorsal eyes is planned on the same fashion as in the vertebrate eye and the pallial eyes of *Spondylus* and *Pecten*, and not on the ordinary molluscan cephalic eye-plan as best exemplified in the eyes of Cephalopods.

I have found *Onchidium* on the north shore of Kathiawar and as it occurred in company with the little Mud-skipper fish *Periophthalmus*, Semper's observation that the fish comes ashore hopping and skipping in pursuit of *Onchidium* is doubtless correct. In such case the presence of dorsal eyes are of special value to the mollusc in enabling the approach of the enemy to be sensed in time to permit of an attempt to escape.

Basommatophora

In the second main division of the Pulmonates, the *Basommatophora*, the cephalic eyes are placed at the base of the single pair of tentacles present, and these tentacles while contractile are not invaginable. The majority of the genera are inhabitants of fresh-water, but the Ellobiidae or Ear-shells are an exception. One Indian species is exceedingly common among the roots of mangroves in tidal backwaters, and others in moist spots near the sea. The shells are oblong or oval with a well-developed spire; the outer and inner lips are thickened and expanded; in one common species both are conspicuously toothed; in others only the inner lip is so armed. Some have a superficial likeness to the little Nassariid *Arcularia*; the form of the mouth is, however, quite different.

Of fresh-water snails belonging to this division, *Lymnaea* and *Planorbis* are typical, the one elegantly spiral, the other discoidal, coiled in a flat sinistral manner. The shell of *Lymnaea* is thin, horny and fragile, with a large body-whorl and usually a sharply elongate spire; the colour brown. In *Planorbis*, generally a much smaller snail and nearly black, the shell is stouter. It is specially

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

remarkable because a lobe of the mantle just outside the pulmonary cavity has been metamorphosed into a functional gill; this genus therefore, derived from an air-breathing land pulmonate, which in origin evolved from a water-breathing gilled marine gastropod, has returned to a wholly aquatic life and has re-adapted its breathing apparatus a second time. It is noteworthy that the original form of the branchiae has not reappeared, a wholly different part of the body being specialized anew for the purpose, a fact which Pelseneer remarks 'illustrates the irreversibility of evolution'.

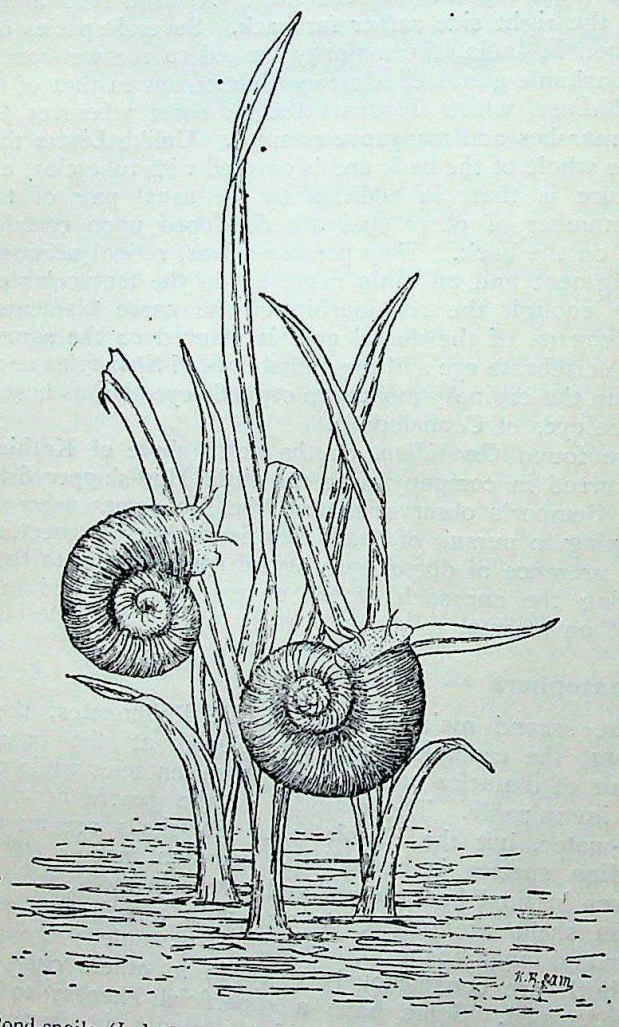


Fig. 43.—Pond-snails (*Indoplanorbis exustus* Deshayes) crawling on water weeds.

Both *Lymnaea* and *Planorbis* have the habit of crawling upside down beneath the surface film of the pond wherein they live, the foot gliding along as if it were moving along a sheet of glass; the well-known phenomenon of the surface tension of fluids is the explanation of this miracle. The spawn of both genera is deposited in colourless gelatinous masses on stones and water

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

weeds. In hot weather when tanks and streams dry up, these water-snails aestivate in the mud after the fashion of *Pila* and *Viviparus*.

Class III.—SCAPHOPODA

Standing apart from all other Gastropods is the little group of the Scaphopods, in many ways so specialized as to appear degenerate for there are neither eyes, nor true tentacles nor any distinct head present; neither is there any gill nor any true 'heart'.

The only well-known species are the Tusk-shells (Dentaliidae). In these the edges of the mantle lobes unite to form a complete tube, and as a consequence the shell is tubular. At one end, the posterior, it is narrow, widening gradually to the other end through which protrudes the broad, muscular burrowing foot and a number of long filaments. These last, the *tentacula*, are believed to be employed for the capture and dragging to the mouth of the foraminifera and diatoms on which these animals feed.

The Tusk-shells belonging to the genus *Dentalium* are often very common in sandy ground in depths of a few fathoms around our coasts; their empty shells are often cast up ashore. The most abundant species in Indian waters, *Dentalium octogonum*, has a very pretty curved shell, snowy white, with eight grooves running down the entire length, giving an octagonal outline in transverse section. It grows to a length of 1½ inch. Another species, very rare, grows to a length exceeding three inches and is stout in proportion. This species (*D. formosum*) which I have seen on only a few occasions, has a shell mottled with shades of dark red, a very handsome object. All live buried obliquely in the sand, pointed end upwards. In this there is a small perforation and through this passes the water required for breathing.

It is interesting to note that the Scaphopods were for long mistaken by naturalists for tube-forming annelids so close is the superficial resemblance both of their tubes and of their head filaments to those of certain of these marine worms.

Class IV.—LAMELLIBRANCHA or PELECYPODA

The most conspicuous characteristic of this class is that the shell is in two parts or *valves*, hence the convenient semi-popular term of Bivalves often applied to them. The mantle consists of two lobes, a right and a left, corresponding to the two valves and enveloping the body between them. A head is virtually absent and no radula or teeth are present, whereas the foot, frequently developed into a narrow, axe-shaped organ, is often of considerable size and of great mobility and strength in sand-burrowing species. The breathing organs are developed into plate-shaped gills, varying greatly in structure; these differences are now made use of in the classification of these molluscs. The majority of species pass their lives in burrows in sand or mud; others anchor themselves by a cable of fine threads, the byssus; in some, one valve is cemented to a stone or a rock; a few bore into wood and stone and others

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

are so exceptionally active that they swim through the water by alternately flapping their valves open and shut.

Their food consists of minute organisms, animal and vegetable, swept within the cavity enclosed by the mantle lobes by the rhythmic lashing of cilia lining the interior. These particles are then intercepted by the filter-like structure of the gills and wafted to the mouth by other sets of cilia.

Before describing some of the common Indian bivalves, an explanation of certain technical terms is necessary for the ready understanding of the subject. If an ordinary bivalve such as a cockle or an oyster be taken in the hand and held in such a position that the hinge is uppermost and the mouth side directed forwards, we are holding the shell with its *dorsal* side uppermost, its *ventral* side down, the *anterior* end turned forwards and the *posterior* end toward the hand holding the shell; in this position the valve on the right is the right valve, the other the left one. The elastic pad joining the two valves at the hinge is the *ligament* and the fine skin often present on the surface of the shell is the *periostracum*. Usually the hinge is formed by small interlocking projections, the hinge teeth. The valves are kept shut by the contraction of powerful *adductor muscles*, usually two in number, one towards each end of the shell. These pass across from one valve to the other; when they relax slightly, the lips of the shell open, the normal condition; after death these muscles relax completely and the shell gapes widely owing to the elasticity of the ligament which acts precisely as though a small pad of indiarubber were inserted under compression in the hinge.

In burrowing species where the shells lie mouth downward in the sand the two mantle folds join posteriorly at three points to form two apertures—the inhalant and the exhalant. In bivalves that bury themselves deeply the margins of these apertures are extended into a pair of long tubes, the *siphons*. Through the inhalant or branchial siphon, water, laden with microscopic food, is drawn within the mantle cavity, where it filters through the gills and then passes out through the exhalant siphon.

The two chief orders of the Lamellibranchs are the Filibranchia and the Eulamellibranchia. In the former the thread-like gill filaments lie parallel to one another and are bent upon themselves (reflected upwards) at about half their length. In the latter the filaments instead of being free are united at regular intervals by cross bars containing blood vessels and thus form a more efficient breathing and food-collecting apparatus—a very perfect form of filter.

Order I.—Filibranchia

False and Window-pane Oysters

The first family for consideration is the Anomiidae. In India both its notable genera *Anomia* and *Placenta* are represented. *Anomia*, often called the False Oyster is a small shell usually about 1½ inch in diameter, frequently adherent to edible oysters wherever found. *A. achaeus* is the common species. It has a beautifully

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

pearly shell, often golden in tint, very like a young edible oyster in shape, but thin, translucent and fragile. It rests with its right or flat valve downwards; the left valve is convex. Through a hole in the lower valve a shelly plug passes; by this it attaches itself to fixed objects. This plug is a modification of the byssus which in most other bivalves consists of numerous elastic horny filaments.

Placenta placenta, the Window-pane Oyster, grows to a much greater size, often five and even six inches in diameter. It is orbicular in outline when adult, very much compressed and remarkable for a Λ-shaped tooth to which the ligament is attached. It forms no byssus, lying more or less prone on the muddy bottom of estuarine creeks and landlocked bays wherever these occur on Indian coasts. Notable localities are Karachi Harbour, the Indus creeks, the Gulf of Kutch, Bombay Harbour, bays and creeks in Portuguese India, Tuticorin Harbour and the neighbourhood of Chittagong.

The foot is long and trumpet-shaped; it is employed mainly for freeing the interior from mud that finds its way in and would otherwise choke up the fine network of the gills. The shell is peculiarly soft; both in appearance and substance it resembles mica, particularly when immature. Small shells are usually colourless, clear and translucent; the Chinese ages ago noted this, and with their usual ingenuity put it to the useful purpose of glazing windows and verandah roofs. For this purpose young shells are trimmed into squares about 2½ in. across and then secured between narrow battens of wood arranged vertically. The Portuguese borrowed the idea and introduced it into their Indian possessions in the 16th century. To-day the windows of the older houses in Goa and Diu are still glazed in this manner; the Governor's old palace at Marmugoa has fine examples of such windows.

In some localities—not in all—*Placenta* produces a large abundance of seed pearls, too soft for jewellery and often misshapen, but still valuable for use in indigenous medicine in India and for the production of an expensive lime as an ingredient of the *pan supari* used by the fastidious wealthy. Four such places in the Indian region are Chittagong, Tamblegam Bay in Ceylon, the Gulf of Kutch and the creeks of the Indus. In all these localities *Placenta* forms beds of great extent, numbering shells by the million; the revenue derived from these fisheries is sometimes of considerable importance. Usually these fisheries belong to the State, a royal prerogative of ancient standing.

The anatomy and habits of *Placenta* are dealt with in great detail by the present writer in his *Report on the Anatomy of Placuna placenta*, etc.[1]

The Ark-shells

The Ark-shells (Arcidae) constitute a large family including many Indian species, varying widely in appearance and habits.

[1] Hornell, J., in vol. i. of *The Report to the Government of Baroda on the Marine Zoology of Okhamandal in Kattiawar*, London, 1909, pp. 43-97, with 5 plates and 2 text-figures. 4to.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

All agree, however, in having the hinge armed with a large number of tiny plate-shaped teeth disposed in a straight row on each side of the hinge. The shells are often angular, radially ribbed and covered with periostracum. The mantle is open and no siphons are present. The best known Indian species are *Arca granosa*, *Trisidos tortuosa*, *Barbatia fusca*, *Glycymeris taylori* and some small species that live in crevices in corals.

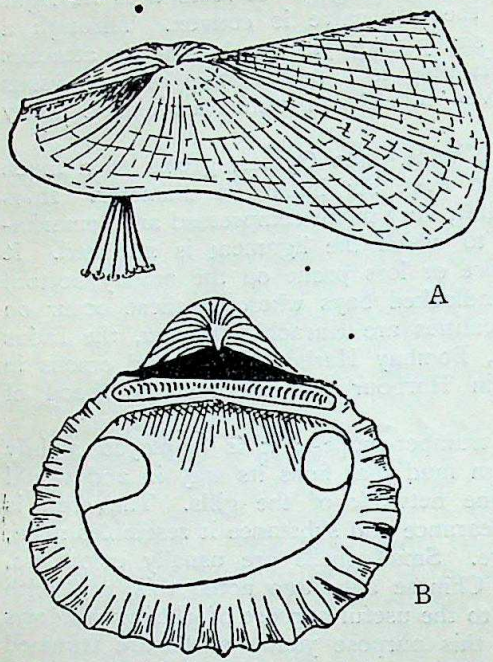


Fig. 44.—A, *Trisidos tortuosa* and its byssus; B, Inner view of a valve of *Arca granosa* L. Both ×1.

The **Ribbed Ark-shell** (*A. granosa*) is a fine shell found widely distributed in backwaters and estuaries. In appearance it looks like a very rugose cockle; the flesh is distinctively coloured red, due to the blood being of this hue, an exceptional condition among molluscs where the blood is generally colourless or tinted pale bluish-green. The flesh is tough but because of its red colour some shore people on the Madras coast have the idea that it has specially nutritious and strengthening qualities; on this account it is often given to women in pregnancy. It is also much valued by the poorer people of coast villages on the Bombay coast who collect great quantities from sandy bays. In size it seldom exceeds 53 mm. in length by a thickness of 43 mm. It is noteworthy that this species is the subject of very profitable cultivation in Japan, where the spat at a size of about 3 mm. are collected from the natural settlement grounds in immense numbers and relaid on special culture areas. As they grow larger, from time to time they are redistributed in order to avoid the danger of overcrowding and consequent food shortage. This species burrows free in sand.

In the open sea the estuarine *A. granosa* is replaced by the Hairy Ark-shell (*Barbatia fusca*) and the Twisted Ark-shell (*Trisidos tortuosa*). The former is ribbed and cockle-shaped, covered with dense black periostracum thickly beset with short bristle-like hairs. The second species was well named *Parallelopipedum tortum* by some authors, for whilst the opposite sides are roughly parallel, none of the angles are right angles and the shell appears as if it had been twisted out of shape when in a plastic condition (Fig. 44, A). The habitat of both the species named is between the $4\frac{1}{2}$ and 6 fathom lines on a bottom of dirty muddy sand.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Neither forms continuous beds, occurring scattered singly over a large area.

A small, elongated and very typical Ark-shell not unlike *T. tortuosa* is found in crannies among massive corals and sometimes in empty burrows made by boring molluscs, especially of the Date-shell (*Lithophaga*). The foot is large and secretes a short and massive horny byssus made up of thin plates of a characteristic bronze green colour.

Closely allied but very different in appearance is the equivalve *Glycymeris*, a common shell in depths of a few fathoms wherever there is sandy bottom. In shape it is orbicular, somewhat compressed and smooth, with central umbones. The hinge is curved and so the line of the comb-like hinge-teeth is somewhat arched instead of being straight as in *Arca*. *Glycymeris* lives free and unattached and so powerful is its crescent-shaped foot that some species are able to leap to a height of several feet when disturbed. *G. taylori* is a common Indian species.

Mussels

The well-known Mussels (Mytilidae) form another large family. The three common genera of these seas are *Mytilus*, *Modiolus* and

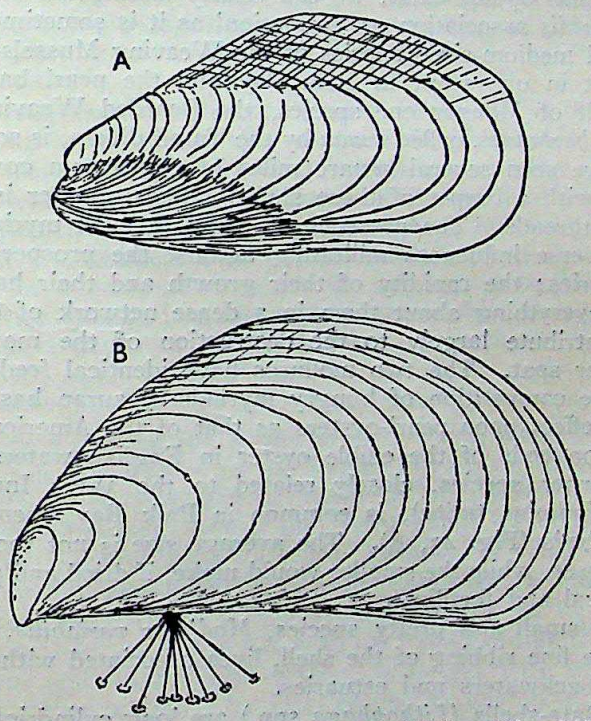


Fig. 45.—A, a typical *Modiolus*; B, a typical *Mytilus* (*M. viridis* L.). ×¾.

Lithophaga. All have elongated shells with the hinge close to the anterior end, and unprovided with teeth. In *Mytilus* the umbones are right at the anterior end; in *Modiolus* they are some distance away. Both live attracted by byssal cables; *Lithophaga* on the con-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

trary has no byssus but is equally sedentary as it bores into limestones and corals and never leaves its burrow once it has formed it.

Two species only of true Mussels grow to a considerable size in Indian waters. One of these is the very handsome Green Mussel (*Mytilus viridis*), readily recognized by the brilliant green colouration of the periostracum investing the exterior surface of the valves (Fig. 45, B.); the other is an even larger species, less elegant of contour, coated with coarse brown periostracum. The green species is widely distributed on both coasts whereas the brown one is confined, so far as I am aware, almost entirely to the extreme southern end of the peninsula—Travancore and Tinnevelly. Although the Green Mussel is to be found wherever rocky ground or oyster beds exist between low-tide level and the three-fathom line, only off the coasts of Kanara and Malabar does it find conditions sufficiently favourable to permit of it forming distinct beds; in Malabar and northern Travancore its collection is a minor marine industry. The flesh is eaten and relished by Muhammadans and Christians and by Hindus of castes inferior to the Nairs. Divers working from small dugout canoes pursue this fishery from December to May.

On the east coast the Green Mussel is found wherever beds of the Edible Oyster exist; we can clearly distinguish an *Ostrea—Mytilus viridis* association or 'formation' as it is sometimes termed.

Several medium-sized species of the Weaving Mussels (*Modiolus* spp.) exist in our seas; in Palk Bay and the pearl bank region in the Gulf of Mannar one species, the Bearded Weaving Mussel (*Modiolus barbatus*), called *suran* by the Tamil divers, is so abundant that I have seen several square miles of sea-bottom covered continuously with a carpet of these shells, felted together in a tangle of byssal threads. The presence of suran in such myriads is one of the adverse influences militating against the prosperity of our pearl fisheries; the rapidity of their growth and their habit of enveloping everything about them in a dense network of entangling fibres, contribute largely to the destruction of the more delicate pearl-oyster spat. The two molluscs have identical feeding habits and so the competition of hungry myriads of suran has the same blighting effect upon pearl-oysters as that of the American slipper-limpet upon beds of the edible oyster in English waters.

The larger species, closely related to the West Indian Tulip Mussel (*Modiolus tulipa*), is common in Palk Bay where it forms extensive beds (Fig. 45, A). The average size is not too small for food purposes, while the smaller would make, if dried and pulverized, poultry meal and fertilizer.

A very small and pretty species, *Modiolus variabilis*, characterized by the fine ribbing of the shell, lives associated with the edible oyster in backwaters and estuaries.

The Date-shells (*Lithophaga* spp.) are long cylindrical mussels, growing to a length of $3\frac{1}{2}$ in., which tunnel into limestone rocks and corals, and sometimes into massive gastropod shells (Fig. 46, B). Two of the common Indian species are *Lithophaga teres* and *L. straminea*. Date-shells bore only into shells, corals, and calcareous rock, the reason being that the boring is effected mainly by means of an acid secretion poured out by glands in the mantle.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This secretion decalcifies the surface little by little and so enables the mollusc to scrape off and remove the softened debris and thereby permit of a fresh surface being attacked.

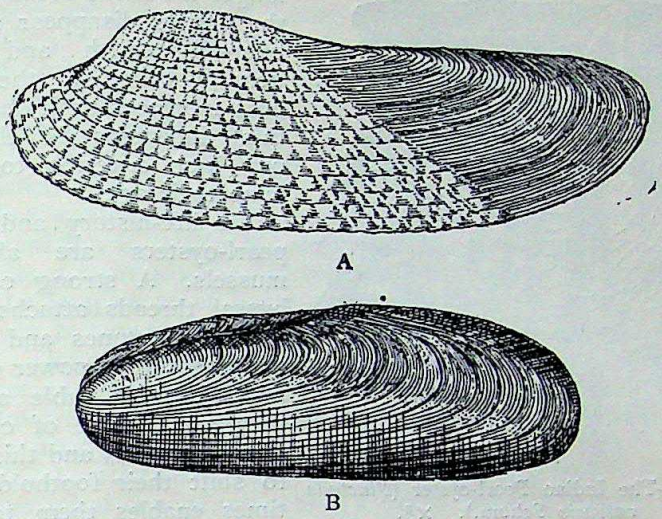


Fig. 46.—A. a typical *Pholad* (*Pholas orientalis* Gmelin.); B. a boring Mussel (*Lithophaga*). ×1.

Of the Isognomidae only one conspicuous species is found in our waters. This grows to a size of quite five inches in diameter; it is often mistaken for a large pearl-oyster. In outline it is nearly the same and the interior is lined with mother-of-pearl. The hinge is distinctive; instead of a single oblong mass as in the true pearl-oyster, the ligament is subdivided into numerous short sections, each sunk in a separate little pit or fossette. The long row of these fossettes renders Isognoma easily identifiable. It is rather rare and lives at a depth of several fathoms on rocky ground.

Pearl Oysters

The large family of the Pteriidae is of great interest to Indian students for in the waters of the Indian Ocean are found some of its best known representatives; these include several species of Pearl-oysters (*Pinctada* spp.), the Wing-shells (Pteriids proper), the Hammer-oyster (*Malleus*) and the curious *Vulsella*.

The Indian Pearl-oyster (*Pinctada vulgaris*) is amongst the smallest of its kind (Fig. 47); it seldom exceeds 3½ in. in height and compares unfavourably in size with the huge Gold-lip (*P. maxima*) from Mergui and Australasian waters, a species with valves large enough for dinner plates. Our local species makes up in abundance for what it lacks in size; at the Ceylon pearl fishery of 1905, over 800 lakhs were fished within six weeks.

The shell is nearly straight along the hinge line and is produced at each end into a short 'ear', a modification of the wing-like projections that give the Pteriids proper their name of Wing-shells. Ventrally the shell is deep and rounded with a series of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

delicate finger-like projections at the ends of radial bands made up of older fingers now outgrown, worn and disused. These pearl-oysters reach their limit of size in about $3\frac{1}{2}$ years; if they survive longer the shells become worn, the fingers disappear and the over-all length and depth actually decrease; the thickness increases until death and this dimension is therefore our best criterion to determine their age.

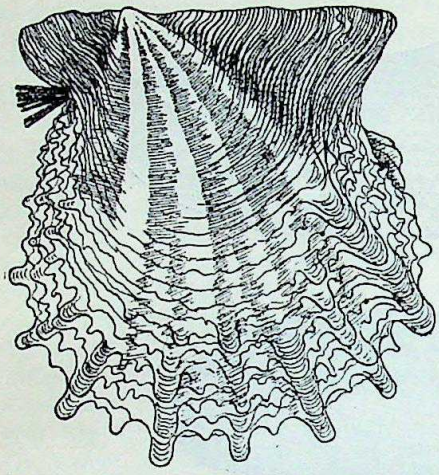


Fig. 47.—The Indian Pearl-oyster (*Pinctada vulgaris* Schum.). $\times\frac{3}{4}$.

In life-history and habits pearl-oysters are akin to mussels. A strong cable of byssal threads attaches them to rocks, stones and shells; they possess the power of casting off their cable at will; they are capable of crawling short distances and this power to shift their foothold sometimes enables them to avoid entombment through an over-wash of sand. When young they are restless and inclined to shift their position frequently. I have often seen them do so six or seven times within a few hours, each place of attachment marked by a tiny tuft of golden byssal threads. The formation of one of these threads takes only a few seconds; the thread is formed from a glue-like secretion poured into a fine groove on the under side of the small tongue-shaped foot. On contact with water it coagulates into a strong, slightly elastic substance, golden yellow in young oysters, dark bronze-green in adults.

The sexes are separate but probably alternate in the same individual in successive seasons; fertilization takes place in the water. Development is rapid, a trochosphere stage first and then a veliger. At the end of about a week or even earlier if conditions are favourable, the larva settles upon the bottom and makes its first attachment. In this condition it is called 'spat'; a satisfactory 'spat-fall' is dependent upon a favourable run of currents at the time the oysters spawn, hence the irregularity of the formation of fishable beds of pearl-oysters in Indian waters. Actually the years when favourable conditions occur are less frequent than those when conditions are adverse—hence the great number of blank years in the pearl-fishing records of the Gulf of Mannar pearl-fisheries.

Pearl-oysters occur sporadically everywhere on Indian coasts but the only places where they are ever found in fishable quantities are the Gulf of Mannar, Palk Bay and the Gulf of Kutch. The greatest of these fisheries is that in the Gulf of Mannar; for over 2000 years it has been the source of intermittent wealth to the rulers of Southern India and Ceylon. That of Palk Bay is of little value for the ground is so muddy and lacking in hard bottom that

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the oysters have perforce to attach to sparsely scattered dead valves of other molluscs.

In the Gulf of Kutch a pearl-fishery is carried on by His Highness the Jam Saheb of Nawanagar. The oysters there do not form beds; they occur scattered along the low-water edges of rocky reefs. They are collected by men wading in the shallows at low water of spring tides; some very valuable pearls have been found.

The origin of pearls in the Indian pearl-oyster has long been the subject of speculation and investigation. After many years' research I have had to revise my earlier conclusions[1] and now I am satisfied that the parasitic inducement of pearl formation in the Indian pearl-oyster is of comparatively rare occurrence; sand grain causation is much the more common and is to be reckoned important; a more prolific source, however, is that due to irritation caused by fragments of nacre dislodged from the inner lining of the valves by muscular strain, which pass into the oyster's soft tissues. These fragments of nacre may wander far; in their course they become invested with a containing sac of nacre-producing cells immigrant from the mantle which lay down successive coats of nacre upon the nucleus, thus forming a pearl. Other pearls, mainly of the seed-pearl kind, are formed around nuclei consisting of microscopical concretions which arise within the muscles at their place of insertion on the shell. These may also wander into the oyster's tissues and may even be found in 'nests' of as many as a dozen or more within the visceral mass. Thus pearl formation may be induced by several different kinds of irritation.

Black-lipped Pearl Oysters

Solitary individuals of the larger Black-lipped Pearl Oyster (*Pinctada margaritifera*) are occasionally found with the common species. It is a handsome, stoutly built shell with a shade of green in the very dark ground colour which is decorated characteristically with several radial lines of white spots passing outward from the umbo. 'Ears' disappear in the adult and the outline becomes sub-orbicular. The nacre of this species is thick enough to be of value in button making but its dark smoky colour greatly impairs its market price. It is much more numerous in the Persian Gulf than on the Indian coast.

Wing-shells

The Pteriids proper, the true Wing-shells, have usually an obliquely oval shell with enormously developed ears at each end of the hinge. Several species may be termed common on rough bottom but they never form beds or banks.

Usually they are semi-commensal, living with particular kinds of sea-fans and hydroid zoophytes. Two characteristic species with this habit are the brown *Pteria radiata* and the brown and white striped *P. zebra*. The former is a typical Wing-shell, the hinder ear prolonged into a huge backwardly directed spine. It is found upon the branches of stout sea-fans (Gorgonids), usually

[1] Herdman, Sir W. A. and Hornell, J. *Ceylon Pearl Oyster Reports*, vol. iii, pp. 49-56. Royal Society, London, 1905.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

coloured brownish orange. When young this Pteriid has the identical rich orange colouration of the sea-fan; its concealment is further aided by the elongated shape of the ears—these simulate branches of the host; shape and colour are so similar that the young readily escape observation on casual examination. With growth these resemblances become obscured, the Wing-shells tak-

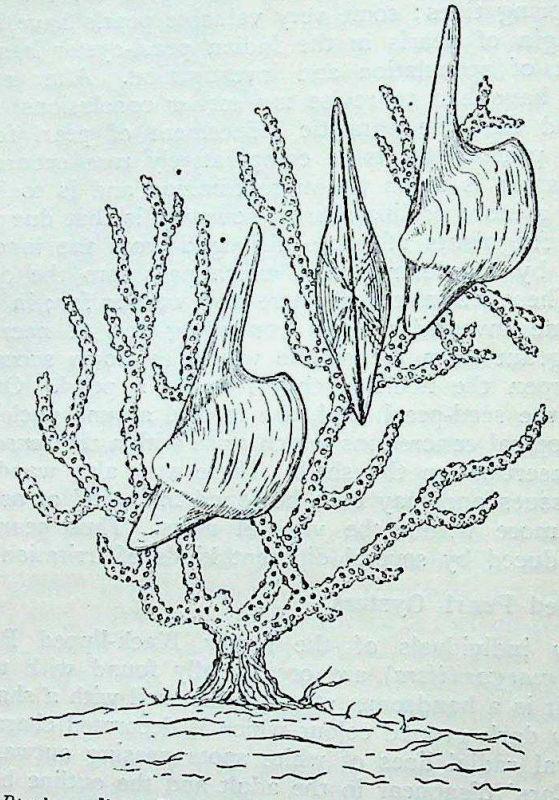


Fig. 48.—*Pteria radiata* Pease, commensal upon a Gorgonid Sea-fan.

ing on darker colour as their shell becomes too stout to escape detection. By that time they cease to be acceptable morsels to

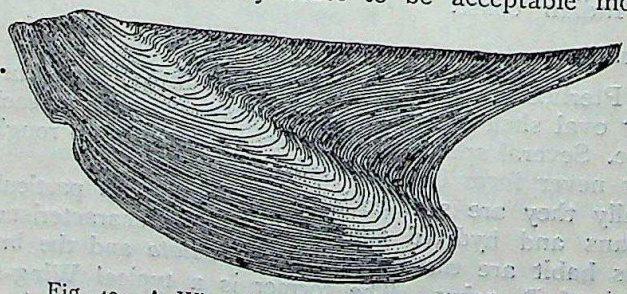


Fig. 49.—A Wing-Shell (*Pteria inquinata* Reeve).

the small fishes that prey upon them when the shell is small and thin.

The Zebra Wing-shells (*P. zebra*) are still more adept at mimi-

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

cry; they live chiefly upon a tall zoophyte, *Halichornaria insignis*. The host has stoutly built pinnate branches of a deep brown colour. Upon these the little Zebra Wing-shells often congregate in numbers, their shells, striped brown and white, exactly simulating the brown pinnules and the colourless spaces between—precisely the same idea as is exploited by the tiger and the zebra; against their usual background they are indistinguishable at a distance.

The smallest of our Wing-shells is *Pteria vexillum*, known in old pearl-oyster reports as 'false spat', for it was mistaken times without number for the spat of the true pearl-oyster, thereby raising unfounded hopes of great pearl fisheries in the near future. It is a tiny shell, seldom more than one-third of an inch long. It occurs frequently in immense numbers in the pearl bank region, clustering in untold millions on seaweeds and zoophytes. While quite young it is difficult to distinguish it from real pearl-oyster spat; only as growth proceeds do points of difference emerge.

The Hammer Oyster

Closely related to the Wing-shells is the Hammer Oyster (*Malleus vulgaris*), a black, misshapen corrugated shell shaped like the letter T. The crossbat at the top represents the two enormously developed ears, the upright, the high narrow body. When young it has the general form and habits of a Pteriid. With increasing age it changes gradually into the monstrous form of the adult, twisted, rough and wrinkled, and usually overgrown with a crust of sponges, hydroids, polyzoa and ascidians—a happy hunting ground for the zoologist. Like all Pteriids a portion of the inner lining of the valves is nacreous; but here it is smaller in area and thinner than usual.

Last of the family is the curious *Vulsella rugosa*, a deep oblong shell without ears. It lives imbedded in sponges, not singly but in numbers, so much so that an 'association' appears to have sprung up between the two, in the same way and for the same reason that the Vermetid gastropod *Siliquaria* forms a similar association with another species of sponage *Vulsella* is particularly common on rough ground in depths of three to five fathoms. No typical byssus is formed; some authorities consider its differences from the true Pteriids sufficient to entitle it to be put in a special family by itself —the Vulsellidae.

The Scallops

The Scallops (Pectinidae) are not well represented in Indian waters and are all small and insignificant unless we include the magnificent smooth-shelled *Amussium*, which by some is placed in a separate family, the Amussiidae.

The true Scallops, such as the common *Chlamys senatoria* have a deeply ribbed shell, usually oval in plan, with two well-developed and conspicuous ears. In the young condition some attach themselves to rocks and stones by means of a byssus; when adult they usually abandon this habit and lie free, resting upon the right or convex valve. They have uncommonly active habits for Lamellibranchs, especially when quite young, when some species dart through the water by the alternate and rapid opening and shutting

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of their valves. Even the adults have considerable power of shifting position in this way. Probably correlated with this unusual activity is the presence of highly developed minute eyes upon the mantle edge. These are placed on the ends of short marginal tentacles at irregular intervals among the longer tentacular filaments margining the gape of the shell. They are always more numerous on the left or superior lobe; in colour they are brilliantly iridescent green, very conspicuous and arresting when the animal is watched alive. In structure they are as complicated and perfect in basic design as the human eye, with a cornea, crystalline lens and retina of complex plan with a well-developed optic nerve. There is no question of the functional value of such eyes; they are made to see with and are valuable for the purpose of warning their owner of the approach of danger, independently of touch.

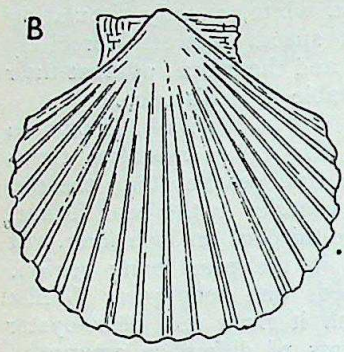


Fig. 50.—A Common Indian Scallop (*Chlamys senatoria* Gmelin.).

The colouration of scallop shells is characteristically vivid; red, brown and yellow predominate but these are believed to be of no special significance. Handsome as are the smaller of the Pectens, met with in shallow water, they cannot compare in elegance with the lovely porcellaneous *Amussium pleuronectes*, met with in deeper water in the Bay of Bengal off the Ganjam and Orissa coast. Unlike the true Pectens its valves are smooth externally, highly polished and handsomely decorated with reddish brown. The dredge is necessary to procure it.

The Thorny Oysters

The Thorny Oysters (Spondylidae) resemble the Scallops in anatomy, even to the presence of eyes bordering the mantle, but they have abandoned a free life completely. The valves are both ornamented with long spines (Fig. 51), and those of the lower (right) valve become cemented more or less extensively to a rock or boulder.

Spondylus is a fairly common shell on rocky ground and among coral reefs, where its brilliant red or yellow valves, decorated with radial ribbing of long spines, are conspicuous. It relies upon quickness of sight and upon the strength and spiny defences of its shell to defy enemies. That its valves may not be

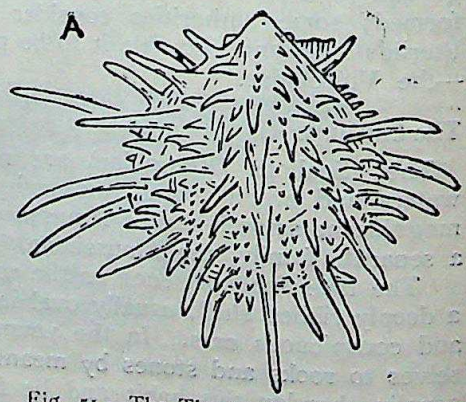


Fig. 51.—The Thorny Cockle (*Spondylus* sp.).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

wrenched apart by main force, a locking arrangement of the hinge is devised. The ligament is a stout pad lodged centrally in a deep triangular pit in the hinge area, with two very stout interlocking teeth in each valve, guarding the ligament. The adductor muscle is also specially strong.

(*To be continued.*)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A BIRD COUNT IN DEHRA DUN

BY

(Mrs.) M. D. WRIGHT

(With a sketch map and a table)

Attempts at making a census of the bird population of a country, or part of a country, have been made in Britain, America and Europe. They have in some degree been successful as a result of nation wide co-operation. One of the chief aims of them is to show up which species are on the decrease in numbers, in danger of extinction and therefore in need of special protection.[1]

In India which has one of the most wonderful avifaunas in the world, great difficulties lie in the way of such an achievement.

Most counts for censuses are taken by counting the pairs of nesting birds in a given locality and calculating their numbers on an acreage basis.

Encouraged by Mr. Sálim Ali, and having read of methods in counting in Hickey's 'A Guide to Bird Watching', I set out to experiment in counting. As the usual methods were not possible for me to work at without any help at all, I have made an attempt at one on my own lines in order primarily to keep a more accurate check on the birds of my general study area. The area of the count therefore is a small portion of my general study area.

Description of Counting Area. (See sketch map)

The area of the count is a flat strip of open cultivation in the Tons valley, 1900 ft. above sea level. It is about 1 mile long by 600 yds. wide at its widest part.

The Tons River which forms its northern boundary is a tributary of the Ahsan River which flows into the Jumna. It is dry for nearly half the year—a typical boulder-strewn hill river.

The southern boundary is a cliff rising up from the valley covered with thick scrub jungle. No birds from here have been included unless they ventured into the open field of the count at the time of counting.

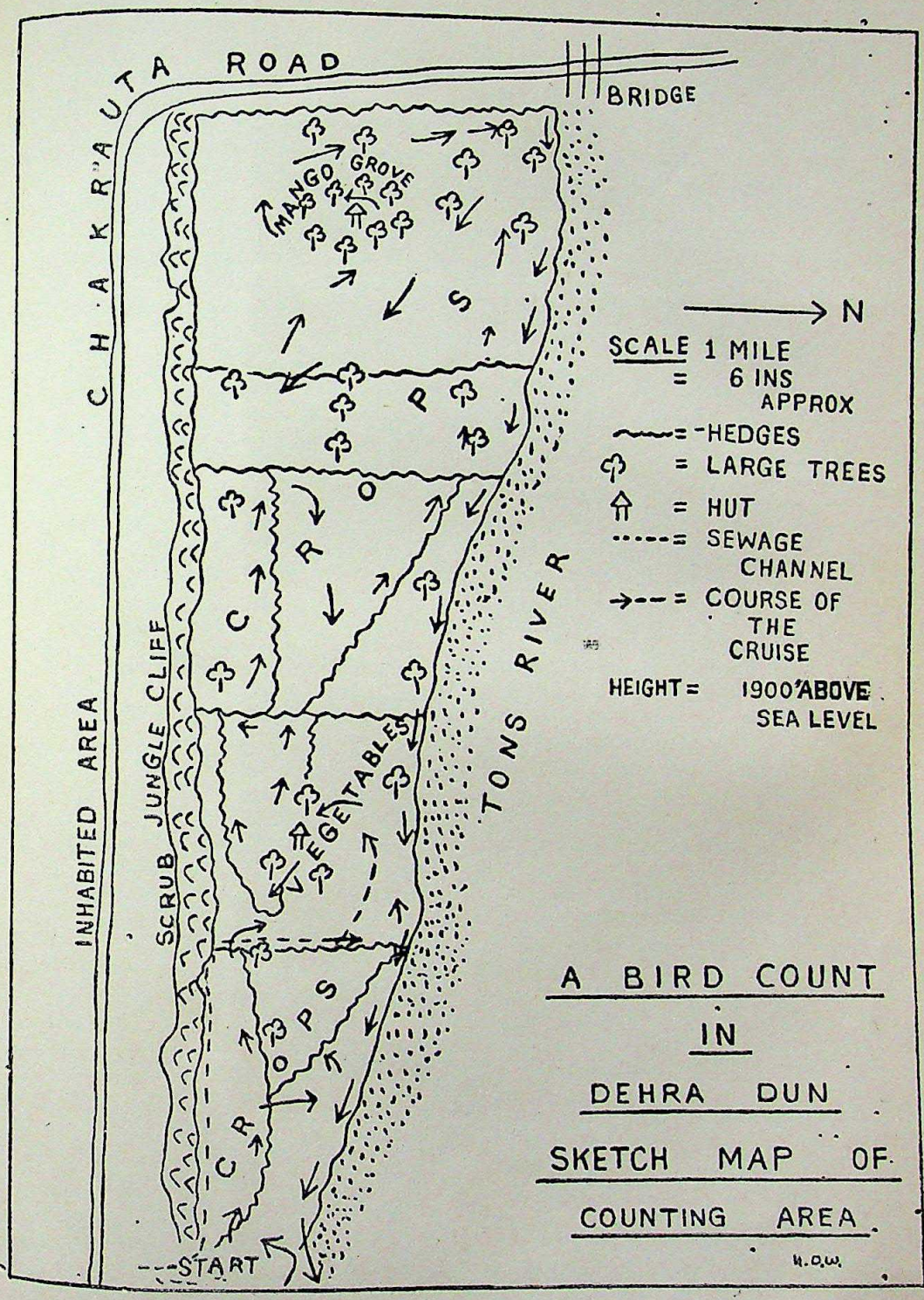
Vegetables and crops are grown in rotation, and irrigation is by sewage brought down from the Sewage Farm above the cliff, thus causing it to be an attractive feeding ground for birds. Hedges between the fields and scattered trees give cover, building sites and resting perches for birds. A small mango grove, which shelters two village huts, is an added attraction.

---

[1] Also, of course, to determine the significance of individual species as economically harmful or beneficial. A study of the food and feeding habits by itself is inadequate unless the local population density of the investigated species is ascertained.—EDS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Aims of The Count.

1. To make an accurate *minimum* census of species of birds that are residents or visitors to that area throughout the course of one year.

2. To keep a check on :—

The Visitors—noting their arrivals and departures, whether these were sudden or gradual, and periods of greatest and least abundance.

The Residents—noting times of courtship, nesting and rearing of young, whether strictly resident or partially migratory.

3. To note the effect of changes of weather and vegetation on the bird population.

4. To note the time of year of maximum and minimum

(*a*) Total number of birds.

(*b*) Total numbers of species of birds.

Apart from the evidence of figures, frequent watching of birds in the same area throws light on

Territorial habits of some species,

Preference of species for a particular type of country or food.

Changes in plumage, and many other interesting aspects of bird behaviour.

Method of Counting.

1. The period covered was from March 1948 to February 1949.

2. Usually the counts were taken with an interval of not more than four days between each.

3. The same course was taken for each 'cruise'. Moving from east to west in a north-south zigzag and returning east along the edge of the river.

4. During each cruise identified birds were marked down with minimum numbers where seen on a rough chart of the area. These numbers when added up under headings of species were made into a monthly list together with notes on prevailing conditions of weather, vegetation etc. at the time of the cruise.

5. Each half of the month an average was taken of the figures for each species, making usually two averages a month. These are the figures recorded.

6. A few adjustments in making the averages seemed necessary and were accordingly made as follows :—

When there were over 100 birds of a particular species only 100 was recorded.

If a solitary member of a species was seen on only one count, it was recorded as 1 in the average for that half of the month due to the probability of its still being about.

The averages were taken to the nearest bird to avoid arriving at fractions of a bird!

Warblers, Pipits and Snipe have been counted collectively under those headings due to the difficulty of differentiating between the different species of them when partly hidden by foliage and in flight.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

7. Only those birds on or in flight over the near edge of the Tons river have been included. Unidentified birds have not been included.

It is to be hoped that there will be many experiments in bird counting in India. If they could be made in adjacent districts over a period of years, results would be of real value. Mr. C. G. Webb-Peploe's 'A Census of Nests in a private Bird Sanctuary' (*Journal B.N.H.S.* Vol. 47, No. 4) is a fine example of what can be done on a private estate where real protection of nesting birds can be maintained along with education to the young of the country.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A BIRD COUNT IN DEHRA DUN—MARCH 1948 TO FEBRUARY 1949

Key to Data	March '48. 3-13. C. 4. Spells of rain. 73°3°—52°. Crops in ear, standing high. Wheat & Oats. 9. 30-11. 45 hrs.	March. 15-30. C. 5. Fine, warmer. 77°—40°. Crops ripening. 7. 30-12. 10 hrs.	April. 2-13. C. 4. Fine, dry. 92°—59°. Harvest begun. 6. 45-10. 30 hrs.	April. 17-30. C. 3. Fine, hot. 100°—67°. Harvest. 6. 15-9. 45 hrs.	May. 4-15. C. 4. Unsettled, hot. 101°—65°. Reaping of harvest. Irrigation of vegetables. 6. 5-9. 20 hrs.	May. 18-28. C. 4. Oppressive, hot. 100°—70°. Fields burnt & ploughed, small sewage swamp. 5-8. 30 hrs.	June. 1-10. C. 4. 104°—74°5°. Ploughing. Hot, unsettled.	June. 22-28. C. 3. 94°—75°. Ploughing & sowing rice. Break of rains. 6-0. 20 hrs.	July. 2-14. C. 4. Rains. 90°5°—73°5°. Rice sprouting. Indian corn ripe. 6.0-8. 15 hrs.	July. 18-30. C. 5. Overcast, rains. 86°—73°. Sowing of rice. River flowing. 6. 30-11 hrs.	August. 5-6. C. 2. Overcast, rains. 83°5°—73°. Crops sprouting. 6. 40-9. 20.	September. 7-14. C. 4. Fine. Intervals. 85°5—70°. Juar crops tall. 6. 30-12 hrs.	September. 17-29. C. 4. Wet spells. 86°—70°. Crops ripening. Trees in fruit. 6. 30-10 hrs.	October. 1-12. C. 4. Unsettled. 83°—65°5°. Crops ripening, harvest begun. 6. 45-11 hrs.	October. 16-30. C. 5. Fine. 75°—58°5°. Harvest. Ploughing & sowing. 7-11 hrs.	November. 2-14. C. 4. Fine. 75°—50°. Harvest. Ploughing & sowing. 7.-10. 30 hrs.	November. 17-29. C. 4. Fine, colder. 69°5°—45°. Rice harvest over, early wheat up. 7-10. 30 hrs.	December. 2-16. C. 4. Mostly fine. 67°—41°5°. Sewage irrig. of young wheat. 7. 15-10. 45 hrs.	January '49. 8-18. C. 4. Fine, frosty. 70°—40°. Irrigation of wheat. River dried up. 7. 30-10. 50 hrs.	January. 22-29. C. 3 Stormy, snow on hills. 62°—43°. Wheat & oats growing fast. 7. 30-10—30	February. 1-15. C. 4. Wet; snow on hills. 67°—41°. Little irrigation. River flowing again. 7. 20-10. 10 hrs.	February. 19-27. C. 3. Fine but cloudy. 74°—47°. Crops in ear. River dry. 7. 20-9. 40 hrs.
1. Corvus macrorhynchos. Jungle Crow	7	17	9	8	9	9	7	7	5	11	14	31	17	15	16	19	23	47	28	29	16	30
2. Corvus splendens. House Crow	2	1	3	1	...	...	3	5	2	2	...	4	4	5	1	6	8	18	6	4	4	1
3. Dendrocitta vagabunda. Indian Tree-Pie	...	...	...	...	...	...	...	...	...	...	...	1	1	2	1	1	...	...	1	1	1	...
4. Parus major. Indian Grey Tit	1	1	2	1	...	...	...	...	1	1	1	2	1	2	2	5	4	4	3	4	4	1
5. Turdoides somervilli. Jungle Babbler	6	13	13	9	6	12	12	7	7	15	13	9	7	13	12	6	6	13	7	4	11	5
6. Argya caudata. Common Babbler	1	1	1	1	1	2	1	2	2	6	3	...	6	6	6	6	4	8	2	3	...	3
7. Pomatorhinus erythrogenys. Rusty-cheeked Scimitar Babbler ...	...	...	...	1	...	1	...	...	...	1	...	...	1	1	1	1	1	1	1	...	2	1
8. Chrysomma sinensis. Yellow-eyed Babbler	1	2	2	4	4	3	5	5	4	4	3	5	4	8	6	8	4	...	...	3	...	1
9. Pellorneum ruficeps. Spotted Babbler	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10. Molpastes caler. Red-vented Bulbul	18	9	19	17	16	12	19	20	15	16	10	8	17	11	12	16	7	6	5	3	7	7
11. Molpastes leucogenys. White-cheeked Bulbul	2	1	2	1	...	1	1	1	2	2	1	...	3	1	1	2	4	1	2	...	1	...
12. Certhia himalayanna. Himalayan Tree-Creeper	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	...	...
13. Tichodroma muraria. Wall-Creeper	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	...	...
14. Saxicola caprata. Pied-Bush-Chat.	7	3	3	3	2	2	5	5	2	1	...	...	1	1	1	1	3	2	2	...	2	...
15. Saxicola torquata. Stonechat	2	1	1	...	...	...	...	...	...	...	...	...	...	1	3	3	4	4	3	2	2	3
16. Rhodophila ferrea. Dark-grey Bush-Chat... ...	3	1	...	...	...	...	...	...	...	...	...	...	...	2	8	6	5	6	8	5	5	4.
17. Phoenicurus ochruros. Black Redstart	1	...	1	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...
18. Chaimarrhornis leucocephala. White-capped Redstart	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	1	1
19. Rhyacornis fuliginosa. Plumbeous Redstart ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	...	...	...
20. Cyanosylvia svecica. Bluethroat	...	...	...	1	1	...	...	...	...	...	...	...	...	...	3	6	6	5	1	2	3	...
21. Calliope pectoralis. Himalayan Rubythroat ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
22. Saxicoloides fulicata. Indian Robin	...	...	...	...	...	...	...	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1
23. Copsychus saularis. Magpie Robin	1	1	1	4	4	4	5	8	6	4	6	4	2	3	2	3	2	3	2	1	2	1
24. Myophonus coeruleus. Himalayan Whistling Thrush	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1
25. Turdus atrogularis. Black-throated Thrush ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
26. Siphia parva. Red-breasted Flycatcher	...	1	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	1	1	1	...
27. Eumyias thalassina. Verditer Flycatcher ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
28. Tchitrea paradisi. Paradise Flycatcher	...	...	2	5	4	4	6	2	4	1	...	1	1	1	...	...	...	...	...	...	...	...
29. Muscicapula tricolor. Slaty-blue Flycatcher ...	1	2	2	1	...	...	...	...	1	...	...	...	...	2	1	1	1	1	1	1	1	1
30. Rhipidura narcola. White-browed Fantail Flycatcher	...	...	...	1	...	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
31. Rhipidura albicollis. White-throated Fantail Flycatcher	...	...	...	...	2	1	1	1	1	...	...	...	...	...	1	1	1	2	1	1	1	1
32. Cheliodorhynx hypoxanthum. Yellow-bellied Fantail Flycatcher	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1
33. Lanius vittatus. Bay-backed Shrike	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34. Lanius schach. Rufous-backed Shrike	5	6	8	7	4	5	4	5.	7	6	6	9	10	6	5	5	5	6	7	7	9	6
35. Hemipus picatus. Brown-backed Pied Shrike ...	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36. Perkrocotus brevirostris. Short-billed Minivet ...	2	7	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...
37. Pericrocotus peregrinus. Little Minivet	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38. Lalage melaschista. Dark-grey Cuckoo-Shrike ...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
39. Graculus javensis. Large Cuckoo-Shrike	1	4	6	5	1	2	...	1	2	2	3	2	2	1	1	3	2	2	3	2	...	...
40. Dicrurus macrocercus. Kingcrow	29	28	16	4	2	...	...	...	...	1	...	...	6	21	11	1	15	11	12	9	13	1
42. Franklinia gracilis. Franklin's Wren-Warbler ...	1	2	4	6	9	6	5	5	6	4	7	4	4	3	1	4	5	2	1	1	1	2
43. Prinia socialis. Ashy Wren-Warbler	...	...	...	...	1	2	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44. Prinia sylvatica. Jungle Wren-Warbler	...	2	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
45. Prinia inornata. Indian Wren-Warbler	1	21	41	18	12	9	5	4	5	4	2	1	1	8	13	15	17	15	9	6	7	5
46. Sylviidae. Other Warblers	...	...	1	4	4	5	5	4	5	4	2	1	1	...	...	...	...	...	...	...	...	...
47. Oriolus oriolus. Golden Oriole	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	17	13	9	19	6	2
48. Sturnus vulgaris. Starling	...	1	3	...	1	3	2	...	2	...	3	3	12	6	1	...	...	...	...	...	...	...
49. Sturnia malabarica. Grey-headed Mynah	...	7	15	15	12	18	15	16	2	11	7	6	12	1	...	1	1	1	1	...	1	2
50. Temenuchus pagodarum. Brahminy Mynah	21	23	37	35	32	29	30	36	24	26	26	19	20	25	51	92	86	51	53	34	36	36
51. Acridotheres tristis. Common Mynah	...	1	1	...	2	...	...	...	...	...	...	2	1	2	17	4	3	8	15	4	2	2
52. Acridotheres ginginianus. Bank Mynah	21	22	12	15	16	17	17	32	6	15	25	38	22	22	21	17	31	34	44	41	22	26
53. Æthiopsar fuscus. Jungle Mynah	3	4	7	6	4	2	3	3	1	2	11	41	43	22	9	19	20	11	11	10	8	6
54. Sternopastor contra. Pied Mynah	...	...	...	...	1	1	1	...	...	2	2	...	...	...	1	1	1	...	...	...	...	...
55. Ploceus philippinus. Baya Weaver-Bird	...	...	...	...	11	31	24	8	...	7	2	...	4	3	3	...	5	1	...	...	...	...
56. Urolonchа punctulata. Spotted Munia	...	2	20	8	4	...	...	...	...	...	...	4	25	17	1	...	...	...	...	...	...	...
57. Carpodacus erythrinus. Common Rosefinch ...	...	4	18	28	24	30	35	31	43	2	...	...	...	...	...	2	5	2	...	...	1	2
58. Gymnorhis xanthodilis. Yellow-throated Sparrow ...	...	1	2	7	18	13	9	4	13	26	32	...	5	4	7	...	...	...	...	...	...	...
59. Passer domesticus. House Sparrow	...	...	...	1	1	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
60. Melophus lathami. Crested Bunting	3	22	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...
61. Metaponia pusilla. Gold-fronted Finch	3	2	2	1	4	2	4	2	1	5	3	1	4	11	4	3	1	2	1	1	4	1
62. Riparia chinensis. Indian Sand-Martin	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
63. Riparia rupestris. Crag-Martin	...	...	...	...	1	1	1	1	...	1	1	3	1	2	6	...	...	...	...	...	1	1
64. Hirundo smithii. Wire-tailed Swallow	...	...	...	...	...	1	3	...	1	1	3	5	18	9	78	160	88	38	...	4	...	...
65. Hirundo daurica. Red-rumped Swallow	1	1	1	1	...	...	...	1	1	...	2	...	12	18	15	29	24	31	35	26	29	25
66. Motacilla alba. White Wagtail	8	5	1	4	...	...	...	...	...	...	...	...	...	2	1	2	1	3	8	15	4	...
67. Motacilla maderaspatana. Pied Wagtail	...	...	...	...	...	...	...	...	...	...	...	4	4	4	3	3	2	2	2	1	1	...
68. Motacilla cinerea. Grey Wagtail	...	1	...	1	3	1	...	...	...	...	...	2	6	1	3	9	8	4	2	1	1	...
69. Motacilla flava. Yellow Wagtail	...	...	...	1	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
70. Motacilla citreola. Yellow-headed Wagtail ...	...	...	...	...	...	1	1	2	1	1	...	...	2	1	23	24	33	55.	47	64	46	37
71. Anthus spp. Pipits...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
72. Galerida cristata. Crested Lark	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
73. Eremopteryx grisea. Ashy-crowned Finch-Lark ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
74. Zosterops palpebrosa. White-eye	2	3	2	6	5	6	6	3	3	2	2	...	4	10	4	...	3	1	...	...	2	1
75. Cinnyris asiaticus. Purple Sunbird	1	1	1	1	2	1	2	1	1.	1	...	...	...	...	...	...	...	...	...	...	...	1
76. Piprisoma agile. Thick-billed Flowerpecker ...	...	1	...	...	...	1	...	...	...	...	1	...	...	1	...	...	...	...	...	...	1	...
77. Brachypternus bengalensis. Golden-backed Woodpecker	1	1	1	1	1	1	...	...	...	1	...	1	1	1	...	1	1	1	...	...	1	1
78. Chrysocolaptes guttacristatus. Crimson-backed Woodpecker	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
79. Iynx torquilla. Wryneck	...	...	...	...	...	...	1	1	...	...	...	1	1	1	1	2	2	...	...	...	...	...
80. Megalaima zeylanica. Green Barbet	...	...	2	1	1	1	1	1	1	1	1	1	1	1	...	...	1	...	...	...	...	...
81. Megalaima haemacephala. Coppersmith	1	1	2	1	2	3	3	2	3	2	1	3	8	1	1	...	1	...	...	...	...	1
82. Coracias benghalensis. Blue Jay	4	4	4	3	5	6	10	9	3	11	7	2	2	3	3	3	3	5	4	4	4	4
83. Merops orientalis. Green Bee-eater	14	7	11	9	12	11	11	8	12	11	11	13	17	15	...	...	...	...	...	...	...	2
84. Merops superciliosis. Blue-tailed Bee-eater ...	...	...	1	29	23	16	15	10	13	2	10	5	4	...	...	...	...	...	...	...	...	...
85. Alcemerops athertoni. Blue-bearded Bee-eater ...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...
86. Ceryle lugubris. Himalayan Pied Kingfisher ...	...	...	...	...	...	...	...	...	...	1	1	...	1	1	1	1	1	1	1	1	1	...
87. Alcedo atthis. Common Kingfisher	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	...	...	...	...
88. Halcyon smyrnensis. White-breasted Kingfisher ...	1	2	1	1	1	1	1	1	3	4	3	2	1	1	1	2	1	3	3	1	1	1
89. Tockus birostris. Grey Hornbill	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	2	1	2	1	1	1	1
90. Upupa epops. Hoopoe	3	1	3	1	3	2	3	4	1	1	1	2	1	1	1	2	8	3	6	7	6	5
91. Micropus affinis. Indian Swift	...	...	...	8	4	41	1	3	3	1	2	3	1	...	...	...	...	...	...	...	...	...
92. Cuculus canorus. Cuckoo	...	...	...	...	1	2	2	2	2	1	...	1	1	1	...	...	...	...	...	...	...	...
93. Clamator jacobinus. Pied-crested Cuckoo ...	...	...	...	1	...	1	...	1	2	1	...	...	...	...	...	...	...	...	...	...	...	...
94. Cuculus micropterus. Indian Cuckoo	...	...	...	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
95. Eudynamis scolopaceus. Koel	...	...	...	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
96. Surniculus lugubris. Drongo-Cuckoo	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
97. Taccocua leschenaulti. Sirkeer	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
98. Centropus sinensis. Crow-Pheasant	...	...	...	...	...	...	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1
99. Palæornis krameri. Green Parrakeet	2	2	15	33	17	7	10	29	33	23	29	2	9	11	14	20	2	11	6	2	11	9
100. Palæornis cyanocephala. Blossom-headed Parrakeet	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
101. Palæornis himalayana. Slaty-headed Parrakeet ...	2	6	6	8	7	5	12	29	27	17	13	22	22	22	22	20	...	...	...	...	...	...
102. Athene brama. Spotted Owlet	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
103. Glaucidium radiatum. Jungle Owlet	3	3	2	2	...	...	1	...	1	1	1	1	1	1	2	4	1	2	1	2	2	1
104. Sarcogyps calvus. King Vulture	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
105. Gyps fulvus. Griffon Vulture	...	...	...	...	1	...	1	2	...	...	...	...	...	...	1	...	...	...	...	1	1	1
106. Pseudogyps bengalensis. White-backed Vulture	...	...	...	...	...	1	...	...	...	6	1	3	1	1	...	...	...	...	...	...	...	...
107. Neophron percnopterus. Neophron	...	...	...	1	...	...	...	...	3	5	2	1	5	2	1	2	1	2	1	3	3	2
108. Aquila rapax. Tawny Eagle	4	4	4	16	9	8	6	4	3	5	4	5	3	4	9	6	5	3	5	4	6	6
109. Aquila chrysaetus. Golden Eagle	...	...	1	...	...	...	...	...	...	...	...	1	1	1	1	...	1	...	...	...	...	...
110. Hieraetus fasciatus. Bonelli's Eagle	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	1	1
111. Haliastur indus. Brahminy Kite	1	1	...	...	...	...	...	...	...	1	1	1	1	1	...	...	...	...	...	...	...	...
112. Milvus migrans. Common Pariah Kite	...	...	...	...	...	...	1	3	1	2	2	3	3	3	3	2	3	3	2	3	2	1
113. Elanus caeruleus. Black-winged Kite	2	2	2	3	3	4	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
114. Circus aeruginosus. Marsh Harrier	...	...	1	1	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
115. Circus macrourus. Pale Harrier	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
116. Astur badius. Shikra	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
117. Accipiter virgatus. Besra Sparrow Hawk ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
118. Falco chicquera. Red-headed Merlin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
119. Crocopus phoenicopterus. Common Green Pigeon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
120. Columba livia. Blue Rock Pigeon	...	...	...	...	...	...	...	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...
121. Streptopelia orientalis. Rufous Turtle Dove ...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
122. Streptopelia chinensis. Spotted Dove	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
123. Streptopelia decaocto. Indian Ring Dove	4	6	12	21	21	21	27	20	18	11	10	13	18	17	17	18	19	22	8	7	6	7
124. Streptopelia senegalensis. Little Brown Dove ...	7	9	6	3	1	2	3	3	3	4	3	3	3	1	10	3	3	1	1	1	1	1
125. Geopelia tranquebarica. Red Turtle Dove ...	...	1	2	1	...	...	1	1	1	...	1	1	1	1	1	...	...	1	...	1	...	...
126. Chalcophaps indica. Emerald Dove	2	3	5	10	7	6	8	8	4	2	3	3	2	1	1	...	...	...	...	...	...	...
127. Gallus gallus. Red Jungle Fowl	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
128. Perdicula asiatica. Jungle Bush-Quail	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
129. Francolinus pondicerianus. Grey Partridge ...	2	3	3	1	1	...	...	1	2	...	1	1	1	1	3	3	1	...	...	...	...	...
130. Coturnix coturnix. Little Brown Quail	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
131. Lophophorus lathami. Red-crested Lowpheasant	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
132. Charadrius fulvus. Eastern Golden Plover ...	4	3	3	2	1	1	1	1	1	2	3	3	3	3	12	12	11	11	15	9	1	1
133. Actitis hypoleucos. Common Sandpiper	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
134. Tringa ochropus. Green Sandpiper	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
135. Tringa nebularia. Greenshank	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
136. Capella spp. Snipe...	...	...	...	...	...	...	1	1	1	3	7	2	1	1	1	2	1	1	1	1	1	1
137. Numenius phaeopus. Whimbrel	...	...	...	...	...	...	...	...	...	...	1	5	4	...	...	...	...	...	...	...	...	...
138. Glareola lactea. Small Pratincole	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
139. Ardeola grayii. Pond Heron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
140. Nycticorax nycticorax. Night Heron	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
141. Bubulcus spp. Egret	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
142. Ardeola grayii. Pond Heron	...	...	...	...

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

REVIEWS

1. INDIAN HILL BIRDS by Sálim Ali. Pp. lii + 188. 64 coloured plates by G. M. Henry, 8 photographic plates, end maps. Size 7″×5″ Bombay—Oxford University Press, 1949. Price Rs. 20.

To supplement his *Book of Indian Birds,* which concentrates on the birds of the plains and human settlements, Sálim Ali has now given us an excellent practical guide to the hill birds. By far the most useful feature of this guide is the series of 64 coloured plates with representations of 117 species of birds. This includes not only all the more common species of hill birds but also a representative of nearly every genus. By reference to an illustrated species it is thus easy to describe in the text many additional species that could not be accommodated on the plates. G. M. Henry reveals himself in these plates as one of our foremost bird illustrators. His plates of the Emerald Dove, of the Blue-bearded Bee-eater, and of the White-throated Fantail-flycatcher rank among the best bird portraits.

The information given in the text emphasizes facts that help in identification, such as voice and habitat. It is somewhat confusing to have mixed in with the field characters the descriptions of similar species, often not even distinguished by a separate paragraph. It would have helped the unwary reader if such similar species would follow a species account rather than being sandwiched within it. Following best modern practice Sálim Ali has chosen the species as the unit of treatment rather than the subspecies. Field characters and ranges of the more distinct subspecies are however given. The nomenclature unfortunately is essentially the antiquated one of Stuart Baker. There is no reason why Indian ornithologists are waiting for a new Checklist of Indian Birds to be published at some future date instead of eliminating the useless generic names that now clutter up the literature. I noticed a few minor ornithological inaccuracies. The Short-billed Minivet of Stuart Baker is actually a conglomerate of two species (*brevirostris* and *ethologus*) which differ in ecology and distribution. The jungle Nightjar (*indicus*) occurs not only in the peninsular hills but also in the Himalayas (*hazarae* Whistler), as noted correctly on p. XXVII. *Caprimulgus monticola* (not *monticolus*) is conspecific with *C. affinis*. Black-headed and Rufous-backed Shrikes inter-breed at a broad front and must be considered conspecific (Dunajewski 1939). These are minor blemishes which do not detract from the value of this useful guide.

In an introductory section the distribution of 287 species in 13 regions of India is tabulated. This is followed by a quick key of the birds on the basis of prominent field-marks ('conspicuous tails,' 'prominent crests,' 'bright, largely blue,' etc.). With this practical guide even the beginner should be able to become quickly familiar with the birds of the hill country. The naturalists of India owe a debt of gratitude to Oxford University Press for publishing such a handsome volume at so low a price.

ERNST MAYR.

2. BOOK OF BAYS by William Beebe. Pp. 240, London. The Bodley Head Limited.

The author's name recalls memories of that exciting book *Half Mile Down* which we read many years ago, and this volume is also full of varied interest.

In the introduction the author says that the book is written 'of an unquenchable desire to know more of the lives—the homes, the food, the enemies, the mates—of certain wild creatures of sea and land.' This expedition which covered the Pacific Coast of South America afforded endless opportunities for studying and collecting the natural inhabitants of that extraordinarily interesting area. There are many items of information, which the author with his extensive biological background associates with relevant facts and theories.

Thirty years ago the island of Guadalupe was said to be a paradise of birds and plants. In the course of years, cats, rats and mice escaped ashore from ships, and somebody also turned loose a few goats. The goats now number 60-80,000 and every growing thing within reach has been eaten up. The cats

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

have eliminated the birds and the whole area is now desolate. The water at the island also appears to be insufficient and the goats were observed drinking salt water and also feeding on the exposed beds of kelp at low tide. This island was the last sanctuary of the sea-elephant and also at one time the northernmost limit of the Fur Seal, several hundred thousands having been slaughtered here. Some protection has now been afforded for both the seals and the sea elephants by the Mexican government and it is hoped that the remnants would survive. But the problem of animal preservation is not confined to India alone, there is reference to a whole colony of sea lions being exterminated very recently to make tinned meat for dogs.

As mentioned before the country is extraordinarily interesting and with the facilities at their disposal, the expedition have seen a great variety of incidents and specimens whose account sustains the interest of the narrative. Among the many items which make the book readable, two of particular interest to the naturalist in India might be mentioned:—

> The Iguana dives off mangroves in swamps into water with closely folded limbs as compared to their spread-eagling their limbs to the fullest extent when jumping from trees on to scrub. They feed entirely on young mangrove shoots and leaves. In some parts of India the monitor lizards are known to live under similar conditions but apart from the fact that they are mainly carnivorous we have very little information about their habits.
>
> Spider Monkeys, so peculiar to South America, when passing through trees in parties, follow one another and use the same holds for hands and feet as their predecessors—the route being fixed as a well-worn trail through thick undergrowth.

It all makes us realise how very much more we have still to learn of the natural history of the birds, mammals, reptiles and the invertebrates of India. Except for an occasional tendency towards polysyllabism and hyperbole, it is certainly the sort of book we would like to see more of.

H. A.

The following books have been added to the Society's Library since July 1949 :—

1. ANIMAL ENCYCLOPAEDIA—MAMMALS. By Leo George Wender (Allen & Unwin Ltd., London, 1948) (A Review copy).

2. MAMMALS OF EASTERN ASIA. By G. H. H. Tate (The Macmillan Company, 1947).

3. INDIAN HILL BIRDS. By Sálim Ali (Oxford University Press, 1949).

4. THE ANAMALLAIS. By C. R. T. Congreve (Associated Printers, 1949 ?).

5. THE FAMILIES & GENERA OF LIVING RODENTS Vol. III, Part I. By J. R. Ellerman [British Museum, (Nat. Hist.), 1949].

6. HISTORY OF THE PRIMATES—AN INTRODUCTION TO THE STUDY OF FOSSIL MAN. By W. E. Le Gros Clark [British Museum, (Nat. Hist.), 1949].

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MISCELLANEOUS NOTES

1.—PARIAH DOGS KILLING TIGER

It may be of some interest to members of the Society to hear of village pariah dogs attacking and killing a tiger cub. This incident occurred on the 23rd of April when a tigress killed two bullocks in a village (Bitkilsoya) near here. The village dogs were also interested in the carcases and it was whilst they were at the kill that the cub appeared and was promptly set upon and killed by the dogs. It was a cub of about three months of age. I have never before heard of village dogs attacking tiger or cubs on a kill.

P.O. JARAIKELA,
B.N. RLY.,
1st May, 1949.

K. M. KIRKPATRICK

2.—A TAME FOX

'Vixen' was a full-grown fox (of the Himalayan variety) when she came into my keeping, so I can take very little credit for her being so tame. I first saw her in the Lahore Zoo and straight away fell in love with her, and made up my mind to get her, somehow or the other. A few days later I was having tea with my chief, and to my horror discovered that he too wanted her. But one bright star rose in the horizon: his wife was all against his getting her, and begged of me to acquire her and take her to the jungles, my normal home. Again luck came to me one afternoon in the shape of my boss discussing the subject with the then curator of the Zoo, in my presence. 'What will you take for her?' he asked. 'Two horned owls' was the somewhat amazing reply. This had been decided in the Committee Meeting a couple of days previously, as, apparently, several people were after Vixen and it was decided to give her to anybody who would produce two horned owls. My boss grunted and walked off in high dudgeon, muttering something about 'might as well ask for two kangaroos at short notice' !! As soon as he got round the corner I asked if the offer held good for me. 'To anybody who provides the owls' and this was good enough. Within an hour I was driving down the canal bank with two rats in a wire cage and my hawking nets in the 'tum-tum' beside me, and at just after 6 p.m. I deposited the owls, and marched off, the proud possessor of Vixen. That was just about 50 years ago but Vixen's memory still remains almost as fresh as when I had her.

Next morning I returned to Wazirabad which was then my headquarters, and had many qualms as to how Vixen would be received by my six dogs. Two terriers, one beagle, two spaniels

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

and a Tibetan sheep-dog. They were, fortunately used to all kinds of pets which master acquired from time to time, and a stern 'NO' when hackles went up, or an aggressive eye was turned on the fox, had the desired result and the introduction went off much better than I had expected. I had many surprises on that first day. After breakfast the dogs, fox and I went for a walk, the latter, of course, on a chain and the first surprise came when I saw her following without the least trouble, and without a single pull on the chain. Somebody had broken her to the chain anyway. The next surprise was on the following day when I let her off her chain, as she showed no sign of running away, and the first thing she did was to make straight for one of the spaniels, roll on her back and squeal with pleasure and 'bonhommie'. The spaniel accepted the advance, wagged his tail and one by one they all came and smelt her, even the sheep-dog. An hour later she was flying across the open *maidan* with the dogs in full pursuit, dodging in and out among them and causing collisions which now and again ended in a free fight among a couple of the dogs, while the others continued their chase after Vixen. She had obviously lived her life among humans, and dogs, and had had a good home, for she showed not the slightest tendency to leave us and loved petting and being made much of. The first night I had tied her to a box in my bathroom, but seeing she was well behaved and obviously not in the least likely to run away, she was promoted to a little bed in the corner of my bed-room and my next surprise came when my early morning tea was brought. I woke to find she had left her bed and was comfortably coiled up at the foot of mine, and as the door opened a set of evil looking teeth came into prominence and with ears back she very distinctly told my bearer—'one step further and you are for it'. The bearer believed her and hung back with the tray, till I had Vixen securely by the collar and drawn up to the top of the bed. She had, however, done her job and now took no further notice of the man. This little drama was enacted every morning during the three years or so that Vixen was with me, and ended in her coming into my arms and biting my chin, ever so lightly, as an invitation to come outside and play. In the house she was cleanliness personified. I should have given anything to find out who her late master and mistress had been who had brought up this very delightful little animal so beautifully, with absolute confidence in man and dog, and no inherent fear of either. How was this engendered? Was she born and bred in captivity, of parents who had lived their lives with man? I cannot, otherwise conceive how this absolute trust in man and dog came into being, in the first generation of life with them. That she accepted me as a pal I can understand as I had known her for some months when she was in the Zoo, and never did I go there without spending 10 to 15 minutes with Vixen and a pocketful of titbits which she much appreciated. But she showed extremely little, if any, nervousness among the dogs nor was she at all alarmed when a stranger came up, as many did, to ask questions about her. My jackals of which I wrote in the August (1948) number of the

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Journal, though equally tame, were always nervous among strangers and either ran away or bristled, when any dog came near, and here was this fox quite at home with my dogs from the first!

In those days I was young and inexperienced but even so it struck me as strange that this should be so, and I just could not understand it and soon gave up trying.

Since then I have kept as pets almost every kind of carnivore in India, and however tame they got they always showed some slight degree of nervousness among strangers. Next to Vixen, a wolf was the tamest and most confiding of all my pets, but unfortunately died when about 10 months old of distemper, or something very like it.

Well, in time, as the spring began to turn into summer I made for my beloved jungles in the S.E. corner of Kashmir (Bhadarwar) where we spent a happy eight months not a little of which was spent in the shady valleys of spruce and fir, or the lovely alpine pastures above the tree limit. Here Vixen showed me how the fox family accounted for voles. As soon as we came upon the little mounds of earth thrown up by the voles in making their tunnels, she began stalking from mound to mound, actually, I think, to find out which was the most freshly thrown up. This done she went off a couple of yards and sat down between it and the next one. She very obviously meant business so I would call my dogs back and we would sit down some 15 yards away to watch for the next move. It came in the most unexpected quarter. Not on top of the mound as I quite expected, but at least 2 to 3 feet short of it, and between it and the next, and here she would begin to dig furiously, working up towards the mound of earth. Sure enough, a little pounce forward and out would come the vole in her jaws to be eaten at leisure. How, when and where, did she learn this trick? From her late master or mistress, or was instinct playing its part? Anyway, it was definitely clever, for had she attacked the mound direct, the vole would have shot down its tunnel at the first sound of disturbance with little chance of being caught.

The dogs invariably watched with the utmost interest and never took their eyes off the fox from the time she sat down to the moment she pounced, but I doubt if any of them profited by the lesson!

The next surprise I got was a year later when walking along a road between two stages, I noticed my dogs showing signals of alarm. It was about 3 p.m. and I could not think what was worrying them, when Vixen suddenly came down the hill shouting her alarm call, almost in hysterics. *Pheaw, pheaw* rang the echoes from a line of cliffs in front. My dogs all came round me, the terriers with hackles stiff and just longing to be off to investigate, but the more sober spaniels and the sheep-dog with flags at half-mast, just terrified. The beagles seemed neutral but for choice would have joined the terriers. Vixen had nothing to do with their concerns but seemed to consider it her duty to let the countryside know, and not to forget, that His Majesty 'Spots' was on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the prowl and somewhere very near. Some villagers ultimately joined us and we moved on down the road, but it was a long time before Vixen quietened down.

I never thought much about it till the question of fox-dog cross came up in the *Journal*, but I cannot ever remember Vixen either enticing my dogs or being particularly attractive to them. The fact remains that in three years there was no mesalliance as far as I know, and certainly no family. It was towards the end of her third year we had a terrible tragedy while walking down the Mussoorie Mall one afternoon, between Landour and the Rink. The dogs were just ahead, there were dozens of people and rickshaws going up and down, and Vixen was just ahead of me and not five yards away, investigating some enthralling smell in the gutter. Suddenly from among the dahlia bushes above the road, a panther sprang down and had taken Vixen before she had even realised there was any danger from panthers. I shouted and threw my alpenstock at him, people on the Mall rushed forward shouting and my dogs turned and promptly gave chase, the two terriers disappearing down the khud not very far behind. That was the last I saw of the most delightful and lovable wild animal pet I have ever kept, who left a blank in my every walk, in the house, and wherever I was, which took a very long time to fill.

FEARN LODGE HOTEL,
ARDGAY, ROSS-SHIRE,
SCOTLAND.

C. H. DONALD, F.Z.S.

3.—A DISEASED GAUR

A bull bison was recently shot in these parts with all four hooves riddled with maggots. Presumably it had had foot-and-mouth disease in all feet. It was somewhat emaciated and could not travel far. It would probably have died within 3 or 4 months.

HONNAMETTI ESTATE,
ATTIKAN P.O. (VIA MYSORE),
6th May, 1949.

RANDOLPH C. MORRIS

4.—CHARGE BY UNWOUNDED BISON

While returning from a morning stalk with a friend along a jungle-clad ridge on March 26th we came, round a corner, face to face with a solitary bull bison about 5 yards off. I was leading, and turned to my friend with the words 'look at this'. I noticed the bull had its head down and its eyes had a strange look. The next moment the bull was on us in a furious charge, as we leapt behind two trees. The impetus of its charge carried it straight over a small precipice bordering the path we were on

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in the evergreen shola; and the bull rolled crashing down, making a clean sweep of all growth in its fall. Apparently uninjured the bull got to its feet and made off; leaving us mystified as to the reason for its extraordinary behaviour. I have never known an unwounded bull to charge. One possible reason for its aggressiveness is that it was undoubtedly irritated beyond endurance by a large tiger that spent its time trying to get a bison. Any old bison would have satisfied the tiger but although I counted 51 bison within a square mile (the only unburnt area for many miles around) the tiger never managed to bag one. When he wasn't stalking bison the latter were chivvying him with terrific snorts and bellows. We watched this interesting performance daily in the mornings. It was no wonder that everything up there got thoroughly peeved with and scared of everything else! In the area were milling around 28 elephants (of which we had previously taken movies and stills at close quarters); these had become fractious too; and made known their strong disapproval of the tiger's presence in their usual way. The herd bull smashed the shoulder of an inoffensive buffalo bait with its trunk. This however may possibly have been due to the fact that the bait was tied on a track used by elephants; and elephants loathe being obstructed by animals on their line of march.

HONNAMETTI ESTATE,
ATTIKAN P.O. (VIA MYSORE), RANDOLPH C. MORRIS
6th May, 1949.

5.—NATURALLY OCCURRING ALBINISM IN A SPECIMEN OF *RATTUS NORVEGICUS* BERKENHOUT.

A wild example of the common or 'Brown' Rat, *Rattus norvegicus*, Berkenhout, trapped in a tenement in the Colony of Hong Kong on 29th December, 1948, seems worthy of record on account of its very marked degree of albinism. The abnormal areas of the pelage are pure white and there is sharp demarcation between these and the other parts of the animal which exhibit the usual greyish brown colouration of the species. The pure white areas include the whole of the belly, a confluent squarish patch occupying half of the right flank, two smaller patches on the left flank, the tip of the tail, the fore feet and the left hind foot. (Right hind foot missing.) The specimen is a female and has the following measurements (in millimeters): head and body 168, tail 172, hind foot excluding claws) 39, ear 20.

There can be no reasonable doubt that this is an instance of naturally occurring albinism, since it is known that no tame albino rats are imported or kept in the Colony of Hong Kong. Whilst the occurrence of a specimen such as this in a wild state may not be very remarkable, this is the first one to have been seen by the writer out of many thousands which have passed through his hands.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

This record is published by kind permission of the Hon. Chairman of the Urban Council, Hong Kong.

COLONY OF HONG KONG, J. D. ROMER, F.Z.S.,
11th July, 1949. Govt. Rodent Control Officer.

6.—HOW LONG DOES THE GIANT SQUIRREL (*RATUFA*) LIVE?

LONGEVITY IN RODENTS AND OTHER MAMMALS.

Some of your readers may be interested to know that our pet Indian Giant Squirrel (*Ratufa indica*) who answers to the name of Susie, is now well into her tenth year. We received her as a well-grown youngster in May 1940, so she must have belonged to the March -April batch of litters. She used to spend the hot weather in Ootacamund, until in 1944 she was taken to Lucknow and survived three hot weathers there and last year went up to the Kumaon Hills. Now she is back in the Nilgiris. Her coat is as glossy, her manners as lively, and I regret to say, her palate as discriminatory, as they ever were, and she shows no signs of incipient senility.

We should be interested to know what is the usual expectation of life among these animals, as she has already outlived all her known contemporaries.

WOODSIDE COTTAGE,
FERNHILL, NILGIRIS, P. S. SUNDARA RAJ
18th July, 1949.

[We have the instance of a male Malabar Giant Squirrel, said to have lived over sixteen years in the museum of the Bombay Natural History Society which died in March 1901.

Squirrels, along with other rodents such as marmots, beavers, porcupines and flying squirrels are reported on the authority of Major S. S. Flower, to have a specific longevity of 5 to 10 years and a potential longevity of 15 to 20 years. Dr. P. Chalmers Mitchell defines specific longevity as the expectation of life at birth of a normal individual of a species, influenced by factors such as constitution, accidents, enemies, diseases as well as its powers of evasion, protection and resistance. Potential longevity, on the other hand, is understood as the age which animals attain when placed in an environment relatively ideal, free from the hardships of their normal habitat, the difference between the two being a rough measure of the natural conditions under which a species lives. Metchnikoff (The Prolongation of Life: 1907) has shown that there is a correlation between duration of life and the relative capacity of the large intestines, animals with a capacious hind gut usually being shorter lived in proportion to their size than those

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

in which the hind gut is reduced. Rodents form an exception to this general rule, as they have a relatively large hind gut and are long lived. The comparatively high specific longevity of this group of animals may be associated with their remarkable power of adaptation to different environments.

The age at which an animal reaches sexual maturity is also supposed to have a correlation with its potential longevity, as in the case of whales for instance. Recent enquiries show that some of the largest whales enter their reproductive phase when only 2½ years old. There is nothing definitely known about the age of cetaceans, but Capt. R. W. Gray (Growth and Longevity of Whales: *Nature*, 1929) mentions instances of the Greenland or Arctic Right Whale, *Balaena mysticetus* living, on harpoon evidence, to ages of at least over 24 and over 37 years.

Major Flower, after his extensive studies on the duration of life in animals, believes that the potential length of life of most of the living animals of the world appears to be dependent on the duration of their teeth, while no relationship is noticeable between the periods of gestation and either specific or potential duration of life. It is also a matter of surprise that the life span of domesticated animals like the cat, dog and horse have neither increased nor decreased during the long period they have been under human control.—EDS.]

7.—THE BLUE-BEARDED BEE-EATER (*ALCEMEROPS ATHERTONI* JARD. & SELBY) ON THE NILGIRIS

In his most interesting and useful book *Indian Hill Birds*, Mr. Sálim Ali says, under 'Distribution' of the Blue-bearded Bee-eater 'Nilgiris (?)'. I do not know why he doubts the occurrence of this bird on these hills. Davison obtained it several times some years ago and the British Museum has specimens (a male from Sigur Ghat dated 10 June 1867, and three from Kullar obtained in October and November of the same year) in its collection. More recently Lt.-Col. H. R. Baker secured one on the Sigur Ghat, which is in the Whistler collection presented to the British Museum.

With regard to this bird's present day status on the Nilgiris my friend Mr. C. Primrose has sent me, at my request, an interesting note on it. He says: 'It is certainly not common and is confined to small areas between 5,500 and 2,500 feet. I have seen it many times on the Coonoor—Mettupalaiyam road, the Kotagiri—Mettupalaiyam road, the Sigur Ghat and the bridle-path between Kil-Kotagiri and Mettupalaiyam. On this estate (Marvuhulla) two pairs have been seen by me from December to July in 1948 and this year, between 5,500 and 4,500 feet. Last year one pair attempted to breed, but deserted the nest owing to coolies digging at it. The tunnel excavated this year was in the same road bank but about 150 yards from last year's one. As it was beyond the reach of the average cooly at least one young was successfully reared to maturity. I several times saw one nearly fully fledged young at the tunnel entrance which, on seeing me, went back out of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sight. The query against the Nilgiris in *Indian Hill Birds* may have been inserted by the author owing to his not having, personally, observed this bird whilst he was in these parts. If that is so, it is not very surprising as it only occurs in pairs or parties of three or four (probably parents and young) in certain favourite localities, quite small in area, leaving these for others at a different elevation, probably from the higher to the lower one, during certain times of the year. Therefore the keenest observer could easily fail to see these birds while on a visit of some months.

The Arab saying "never the time, the place and the loved one together" is applicable to this bird on these hills.'

KENILWORTH,
COONOOR, NILGIRIS,
20th August, 1949.

CHAS. M. INGLIS
F.Z.S., C.M.B.O.U.

8.—CHANGE IN HABITS OF THE CEYLON HAWK-CUCKOO (*HIEROCOCCYX VARIUS CICELIAE* PHILLIPS)

Until recently the Hawk-Cuckoo in Ceylon was considered to be solely a migrant from the mainland, arriving early in November, 'and makes its way at once to the hills, taking up its abode in considerable numbers in the forests of the main range' (Legge). As it was noticed, considerably after Legge's time, that it was sometimes heard in the South-West monsoon, it was also thought that some birds loitered.

As far as I am aware, there was no concrete evidence that this bird was a resident in Ceylon until Mr. R. West, of Rookwood Tea Estate, Hewaheta (altitude 5,500 feet), shot a fledgling on 22-4-1949. On January 26th, in the same year, I saw a pair copulating on a tea estate in the Agrapatana district, altitude about 5,700 feet. Since then quite a number of fledglings have been seen in various parts of the wet zone hills, from December to May, all with the Ceylon Babbler (*Turdoides striatus striatus*) as fosterer. So far none have been seen in the dry zone hills, where the cuckoo is much less frequent.

The belief that it was a migrant rested very largely on Layard's statement that he shot three specimens in the outskirts of Colombo, and the bird's habits were such that it appeared to leave the island with the other migrants.

Its tendency to move down from the higher altitudes when it has finished breeding, and with the onset of the South-West monsoon, must have been more marked in Legge's day, when it frequented much higher altitudes than it does now. Then it probably moved down to jungle at lower elevations, where its occasional out of season calling would not be remarked, but as it was not heard in the jungles around Nuwara Eliya (6,000 feet and upwards) and on the Horton Plains (7,200 feet and upwards) from May to November, it was naturally thought to have left the island.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Layard's three specimens, shot in the old Botanical Gardens, Colombo, were thought by Legge to be newly arrived migrants. Whether this was so, or whether they were wandering Ceylon Hawk-Cuckoos, it is impossible to say; but the fact remains, that except for these three specimens, there is no evidence whatsoever that *Hierococcyx varius* visits Ceylon.

That the Ceylon Hawk-Cuckoo wanders down to the foothills when not breeding, is evident, as I have seen an adult in August (also a juvenile in September) on a tea estate in the wet zone foothills, altitude about 700 feet, and occasionally seen and heard males in the same area later in the year. These birds were obviously on the move, and there was no sign of them staying to breed. As far as I know, it has never been recorded from the plains of Ceylon——unless Layard's mysterious three birds belonged to the island race.

Legge, in the 1870's, wrote of its distribution as follows: 'It is common about Nuwara Eliya, Kandapolla, and the "plains" lying between the Sanatorium and Totapella. On the Horton Plains themselves it is no less numerous. . .' He also says that Mr. Bligh wrote that it was not uncommon in the Haputale range, and that it was yearly to be found on the Harangolla patanas (about 4,000 feet altitude) in considerable numbers. These patanas are in Kotmalie.

From this one learns that it was a bird of forest and patana land, quite common from an altitude of about 4,000 feet up to the highest elevations. Nowadays it appears to be almost entirely a tea estate bird, between altitudes of about 3,000 feet and 6,000 feet, and has practically forsaken its old haunts around Nuwara Eliya and the Horton Plains, though by far the greater part of these forests are still virgin. One does still hear an occasional bird calling in these high altitude jungles, a veritable voice crying in the wilderness, but I think such birds are only wandering. The last time that I heard a breeding group in these areas was in 1922. I was camping with friends at Pattipola (altitude about 6,400 feet), and we often rode through the jungles beween Ambawela and the Horton Plains by the old bridle road, but we only came across this one group of Hawk-Cuckoos, near Ambawela, which were making themselves heard far and near.

Not only has this Hawk-Cuckoo changed its habitat, but it has presumably changed its fosterer too. In Kotmalie there is a chance that *Turdoides striatus striatus* may have been available as a fosterer, as I believe that there was a certain amount of cultivation there even in early times, and the Ceylon Babbler must have open or cultivated country for its habit. But, on the other hand, Legge says that this babbler was not found above 3,000 feet in the *wet* hills, in his time. Over the rest of the Cuckoo's range, which apparently consisted of patana forest there can only have been the Ceylon Rufous Babbler, *Turdoides rufescens*, available as a fosterer.

This bird is a rufous counterpart of *Turdoides striatus striatus*, with orange bill, legs and feet. It is entirely a jungle bird, and has retreated with the clearing of the forests. The eggs are

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

almost identical, both in size and colour, with those of *Turdoides striatus striatus*. It is common in the jungles of the Horton Plains, and in those round Nuwara Eliya, and is found down to sea level in the wet forests of the south-west corner of the island. It seems probable that the Hawk-Cuckoo used it as fosterer, as it must have been common in this cuckoo's old breeding haunts, as it still is today.

That the Ceylon Babbler moved slowly up the wet hills, in the wake of cultivation, is certain. I well remember my excitement, when, as a child in Dikoya (altitude 3,700 feet) I saw a large, pale brown bird in our garden, that I had never seen before. That must have been about 1910. In five years time the Ceylon Babbler was a common breeding bird in the Dikoya District, and is now found plentifully up to an altitude of nearly 6,000 feet in these wet hills. As it moved up, the Hawk-Cuckoo apparently moved down, adopting it as its fosterer instead, it would appear, of the more elusive Rufous Babbler, which is said to conceal its nests with great care.

Whether the Hawk-Cuckoo has increased or decreased owing to these changes of habitat and (presumably) fosterer, it is hard to say. I would not state, like Legge, that it is now found in 'considerable numbers' but, on the other hand, it is now spread over a larger tract of country.

118, Boxley Road,
Maidstone, Kent, England,
26th August, 1949.

CICELY LUSHINGTON

9.—GREEN PIGEONS IN A SWAMP

May I add to the notes on the above subject by Messrs. Frend (April 1948, Vol. 47) and A. St. J. Macdonald (December 1948, Vol. 48, p. 184)? In the *Ibis* (1939) I recorded finding many hundreds of Grey-headed Imperial Pigeons (*Ducula badia griseicapilla*) at a salt lick in the Triangle and in other parts of the lower Kachin hills. I obtained both the Wedge-tailed Green Pigeon (*Sphenocercus sphenurus*) and the Pin-tailed (*apicauda*) at licks. The various plains species of green pigeon were also extremely numerous at salt licks in the Pidaung Game Sanctuary.

Stanton's Farm,
Kingsclere, Newbury,
19th June, 1948.

J. K. STANFORD

10.—WOODCOCK OUT AT SEA

While on patrol in the Bay of Bengal on the 22nd October 1942 just after the Midnapore cyclone, a woodcock was seen flying round the ship at daybreak. After several abortive attempts to alight on the shrouds it eventually settled on deck in the shelter of the 4-inch gun mounting, on the forecastle.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The position of the ship when the bird came aboard was approximately 112 miles W.S.W. of Elephant Point which was the nearest land.

It remained on board in the same position all day in spite of the fact that owing to heavy weather sheets of spray were thrown over it. Though obviously exhausted it would neither drink water nor eat bread crumbs and some bully beef placed near it.

About 5 p.m. when Elephant Point (a few miles south of Cox's Bazar) was sighted, the bird flew off towards the coast.

The previous three days we had experienced very wild weather with high winds and heavy seas in one of the worst cyclones for many years, and presumably the bird must have been blown out to sea either from the Sunderbans or the Arakan Coast. It might have been from either as the wind was constantly changing direction.

c/o GRAHAMS TRADING CO. (India) LTD.,
16, BANK STREET, BOMBAY, A. E. G. BEST

4th August, 1949.

11.—OCCURRENCE OF THE WOODCOCK (*SCOLOPAX RUSTICOLA* L.) AT MOUNT ABU

While on holiday at Mount Abu on 2nd July this year I was surprised when R. K. Nirmalkumarsingji of Bhavnagar's shikari brought me a woodcock he had caught in a damp spot in the forest near the St. Mary's High School. The bird was caught in a net set for spur-fowl and other ground birds which this shikari was catching for my aviaries. I examined the bird at leisure and there can be no doubt about the identification. The weight of the bird was ten and a half ounces.

JASDAN, Y. S. SHIVRAJKUMAR

20th July, 1949.

12.—MERGANSERS FISHING

During a recent visit to Assam (March 1949), we camped for a few days in beautiful surroundings on the banks of the Manas River, where it emerges from the Bhutan Hills, into the North Kamrup Game Sanctuary. Though one is hardly 300 feet up here, the river is icy cold, and several Himalayan birds which one usually associates with higher elevations were seen. Among them were Ibis-bills (a party of nine was seen at one time), Himalayan Pied Kingfishers, White-capped Redstarts and Mergansers.

Stuart Baker in the Fauna (Vol. VI, 473) says 'the Mergansers are most interesting birds to watch, as they either swim upstream

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

singly against the not inconsiderable current, or work in parties of six to eight birds across the stream from shore to shore'.

When the birds were in parties on the Manas, we often noticed a similar number of Little Egrets in attendance. As the mergansers approached the shore, the egrets would fly over them and take up advance positions in the shallow water, the fish being hemmed in between the egrets and the mergansers. As the mergansers closed in, there was a lot of excitement and rushing about, and both parties appeared to catch quite a few fish. In the last stages, some mergansers darted forward over the surface of the water in inexplicable spurts as if jet-propelled. A black-bellied tern occasionally took up a fish between the two parties. The mergansers would then turn round and work back across the stream, the process being repeated by the egrets. The birds all seemed to work in a very amicable and co-operative manner.

c/o FAIZ & CO.,
75, ABDUL REHMAN STREET, HUMAYUN ABDULALI
BOMBAY,
15th April, 1949.

13.—BIRD MIGRATION IN INDIA

Since the publication of records of recoveries of ringed birds in or from India (Vol. 47, pp. 690-99) the following information has been received from the Bird Banding Bureau, Moscow to complete the four blanks under the 'Date' and 'Place where ringed' columns on page 698.

No. of Ring	*Date*	*Place where ringed*
81029 E (Moskwa)	12-8-1941	Astrakhan
68993 D (Moskwa)	25-7-1939	Astrakhan
60276 D (Moskwa)	4-8-1937	Lake Teten, Eastern Kazahstan (Not *A. acuta* as reported by recoverer, but *A. strepera*).
54294 E	4-8-1937	near Semipalatinsk, E. Kazahstan.

114, APOLLO STREET,
FORT, BOMBAY,
15th May, 1949. EDITORS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

14.—FIELD IDENTIFICATION OF BIRDS

In the study of birds in India, we have now reached a stage when extensive field observations are almost as important, if not more so as collections of skins, and it might be profitable to draw the attention of all students to the necessity of scrupulous carefulness in their recordings. The following extract from Peter Scott's 'Wild Chorus' (Country Life Ltd., London, 1938) will serve to remind observers of their responsibility:—

> '"Now *you'll* be able to tell me" they always begin. "The other day I saw a big bird. What would it have been? It had a white head and a black breast."
>
> "Of course", I reply, "it might have been a Shelldduck, only that has a black head and a white breast."
>
> "Well, now I come to think of it, that's just what this bird did have."
>
> There can be further developments on the theme. "I'll tell you what, thought", say I, "didn't it have rather a turned up beak?" "That's right." "Well, I believe it was almost sure to have been an avocet, which is a very rare bird. How interesting!"
>
> I have to be very brazen about this, because by this time I have little doubt that the bird in question was in fact none other than a magpie.
>
> But sometimes the mystery bird is not so easy to identify. The most bewildering are those which are described by a reliable observer and which do not fit in with any known bird. I am left wondering whether my informant was mistaken or whether he has in truth discovered a species new to science.'

As regards the claim made by some persons to be able to differentiate between confusing subspecies of birds in the field, Col. R. Meinertzhagen (*Ibis*, 1943, p. 349) wrote:—

> 'My experience of sight records is that they lead to gross errors. I have placed a bullet in a tree-trunk thinking it was a giraffe; I have also shot a "hyaena" and picked up a lion; I have seen Whooper Swans in a mirage which gave the hallucinatory semblance of Pelicans complete with pouches; I have seen Sheld-duck in glare which would have been recorded as avocet if they had not been seen later in shade; I have seen a reputable British ornithologist pointing out a soaring Buzzard as a Sea-Eagle to a party of gaping German ornithologists, and I have seen two batteries of anti-aircraft guns firing at 15,000 feet at an Egyptian Vulture at 5,000 feet, thinking it was an enemy aircraft.'

A good many puzzling and even improbable records have found their way into ornithological literature in this manner; and once in print such records can seldom be effectively correctd or eradicated.

While therefore it is gratifying to notice the swelling ranks of bird watchers in India within recent years, it is hoped that side

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

by side with increasing interest there will also grow a proper appreciation of the difficulties and drawbacks inherent in all sight records of birds, and of the importance of correct identification for notes to be of the fullest scientific value.

114, APOLLO STREET,
FORT, BOMBAY, EDITORS
10th *July*, 1949.

15.—PRESERVATION OF WILD LIFE

Lt.-Col. Burton is to be congratulated for the missionary zeal with which he has championed the cause of wild life in India. Forest Officers who spend the best part of their lives in jungles get to know and love their animal associates to the extent of being jealous of sportsmen. The credit for whatever protection was afforded to our wild life in the past goes to the lone forest officer who among his multifarious duties found time to enforce the game laws and apprehend poachers. In the United Provinces, it was at the intitiative of the Forest Department that the first National Park in India was constituted. This year, I succeeded in creating the Rajaji Sanctuary in the Siwaliks, which comprises shooting blocks once reserved for the Governor-General. Not unoften a Divisional Forest Officer would initiate special closure for deer after a severe rinderpest had taken its toll and decimated their number. In the Saharanpur Siwaliks, I used to arrange special watering facilities for our animals. Champion's photographic studies of wild life are known the world over.

2. Far be it from me to belittle the part played by eminent sportsmen like Col. Burton in rivetting the attention of the public to the need of preserving wild life. Officers of the civil and military services have rendered yeoman service to this noble cause.

3. While agreeing with much that Lt.-Col. Burton has said in his valuable pamphlet on 'Preservation of Wild Life'[1] and in the supplement issued later, I cannot reconcile myself with the view expressed by him that the interests of wild life come in such sharp conflict with forestry, that forest officers cannot be entrusted with the task of looking after animals, a task which they have performed so well for the best part of a century. Theirs has been a labour of love. I do not deny our shortcomings, but I do feel that the contribution of several generations of forest officers towards the preservation of wild life deserves better appreciation.

4. I must confess, I see the advantages of organising a separate Wild Life Department, the best justification for it being its ability to cover vast areas outside the reserved forests. In the early stages, however, the balance of advantage would lie in enlisting

[1] Reproduced in the *Journal of the Bombay Natural History Society*, August 1948.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

both the services and the co-operation of forest officers in the stupendous task of preserving wild life. True, forest officers are not conversant with the modern technique adopted in the preservation, control and protection of wild life. But, what I submit for the consideration of enthusiasts like Lt.-Col. Burton in that after all said and done, an average forest officer knows far more about wild life than an average civilian or an agriculturist or even a sportsman. One wonders where the game wardens and upper grade assistants will come to be recruited from in Burton's scheme. In no other walk of life is even a nodding acquaintance with the animal kingdom available except in the forestry profession.

5. There is at present neither need nor room for organising a separate Wild Life Department. Might I urge that the solution of the problem lies in the adoption of a middle course? The cadre of the Forest Department should be supplemented to enable it to organise wild life preservation on modern lines. What is needed is not the creation of a separate department consisting of a large number of whole-time officers, a host of clerks, menials, orderlies and other paraphernalia, but the appointment of regional wild life officers working in close collaboration with the existing Forest Departments and their vast organisation for surveying, mapping, policing and maintenance of roads and resthouses.

6. The sort of organisation which I envisage for the United Provinces is as under:—

(i) Provincial board for the preservation of wild life.

The board will consist of the following members:—

(1) Honorable Minister in charge of the forests or his Parliamentary Secretary (*Chairman*)	1
(2) A member from each of the 2 houses of legislature	2
(3) Enthusiasts from sporting circles	2
(4) Chief Conservator of Forests	1
(5) Director of Agriculture	1
(6) Director of Veterinary Services	1
(7) A senior Commissioner	1
(8) Provincial Wild Life Officer (*Secretary*)	1

The functions of this board should be advisory. It will be a sort of standing committee to advise Government in respect of legislation to be enacted for the preservation of wild life. The board will direct its secretary to devise ways and means to enforce existing game laws to afford facilities for tourists and to secure protection from and for wild life. The board will meet twice a year.

(ii) The Provincial Wild Life Officer will be recruited from among (1) experienced forest officers noted for their studies of wild life and (2) eminent sportsmen. There will be no age-limit. He will have two regional officers to assist him who will be styled as game wardens. Each game warden will have 2 field assistants.

(iii) Offices. The Provincial Wild Life Officer will be attached to the Chief Conservator but will have an office of his own. Regional

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

game wardens will utilise the divisional office organisation and will be attached to specific divisions in which sanctuaries are situated.

(iv) Menials. Each Wild Life Officer will have *shikari* orderlies.

7. The budget provision for the above organisation will be somewhat as under:—

		Scale of pay	*Average annual pay*
		Rs.	Rs.
(1) Administrative and executive staff—			
Wild Life Officer 1	...	500–50–1,200	11,351
Game Wardens 2	...	250–25–400–EB–30–700–EB–50–850	14,208
Field assistants 4	...	75–5–120	5,224
Total	...		30,783
(2) Clerical establishment—			
Senior Clerk 1	...	80–5–100–6–130	1,411
Typist 1	...	60–3–90–4–110	1,080
Junior Clerk 1	...	60–3–90–4–110	1,080
Draftsman 1	...	50–4–90–5–125	1,264
Total	...		4,835
(3) Menials—			
Shikari orderlies 6	...	25–½–30	2,064
(4) Travelling allowance including that of members of the board.			12,500
(5) Contingencies, photographs, etc....			4,818
Total	...		55,000

8. All expenditure incurred on the preservation of wild life should be debited to a separate budget head. Similarly, all revenue from

(1) Shooting and fishing fees,
(2) Fines for breaches of shooting rules,
(3) Sale of horns, hides tusks and other trophies,
(4) Sale of animal photographs,
(5) Fees charged from sportsmen for the occupation of resthouses.

should be credited to a separate head of revenue.

9. Associations organised in the past for the preservation of wild life have seldom functioned. The Association for the preservation of Game in the United Provinces is virtually a defunct body. The Forest Department has contributed a sum of Rs. 1,200 per

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

annum as a grant-in-aid for many years to this Association. This year, I have not been able to contact the Secretary, despite many reminders and no one is forthcoming to take the grant sanctioned by Government.

10. Here is an inexpensive organisation which is likely to be self-supporting in due course. It has a fair chance of being accepted by Provincial Governments without much ado. Anything more elaborate, I am afraid, would remain an idle dream.

NAINI TAL, U.P.
8th *February*, 1949.

M. D. CHATURVEDI
B.SC. (OXEN), I.F.S.,
Chief Conservator of Forests,
United Provinces.

[Lieut.-Col. Burton comments on the above as follows:—

'This constructive note is the first communication regarding my pamphlet received by the Society, or by me, from any officer of the Indian Forest Service. As such it is very welcome; also because criticism by an experienced officer of the Forest Department has much value.

Mr. Chaturvedi appears to have overlooked the handsome and well deserved tribute expressed in paragraph 8 of the supplement (published antea pp. 290-99) to the many officers of the Imperial Forest Service who, throughout their service, worked continually and persistently to enforce wild life protection and the laws and rules in regard to it, and to have them perfected.

In paragraph 4 of his note the Chief Conservator sees the advantages of organising a Wild Life Department. In the next paragraph he says here is neither need nor room for organising a separate Wild Life Department, and advocates a middle course which he outlines in some detail.

In other countries it has been found that half measures are futile and waste of time; and that there is in fact no satisfactory middle course.

The Chief Conservator wonders where the wardens and upper grade assistants will come from. Surely it can be envisaged that the bulk of them will be obtained from among those of the Forest Service who have at heart, as has the C.C.F., the interests of the wild animals and birds they have seen daily in the forests through the years of their service. Recruitment of staff would be through careful selection of applicants in all grades.

All things have a beginning. Perhaps the scheme drawn up for the United Provinces by the Chief Conservator will herald the commencement of the much needed all-India policy envisaged in Section D of the proceedings of the Conference held at Delhi on the 6th September 1948 to secure the implementation of a co-ordinated forest policy dealing with inter-Provincial and national matters.

There is no matter more wholly national than the effective protection and preservation of that Wild Life which is the Vanishing Asset of the peoples of this country.—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

16.—WHAT ARE THE CAUSES OF THE DISAPPEARANCE OR REDUCTION OF FAUNA SPECIES FROM CERTAIN AREAS?

While it is recognised that poaching (cum wild dogs) are probably responsible for the extinction of the nilgai (blue bull) over most of South India; and of black buck and chinkara over wide areas, this cannot account for the very remarkable diminution of the chausingha (four-horned antelope), and the ubiquitous jungle sheep (barking deer) from areas in which they were very numerous only a few years back. Poachers rarely waste valuable powder and shot on such small creatures. Nor can the decrease be solely attributed to wild dogs. The barking deer (jungle sheep) is now rarely seen or heard in the North Coimbatore and Kollegal Forest Divisions, and the adjoining Mysore State jungles; and yet they were very common up to 7 or 8 years ago.

What caused the disappearance of the Cheetah or Hunting Leopard from South India—indeed over India as a whole?

The Jackal suddenly disappeared from that part of the plateau lying at an elevation of 3,000 feet east of the Billigirirangan Hills (Coimbatore District) some 15 years ago, and has never returned, although it still occurs further to the east at a lower elevation (2,000 feet).

Hyaena are now rare in the same 3,000 feet area. Panther, which up to 4 years ago were numerous in the forest divisions referred to above are now seldom seen or heard of. The decrease of barking deer, etc., may have something to do with this. Pig, once very numerous in the same jungle, are equally rare now.

Up to 5 or 6 years ago the low country scrub jungle (elevation 1,000 feet to 3,000 feet) to the east and west of the Billigirirangans and the Bargur Hills teemed with jungle fowl, grey partridge, peafowl, quail, and spurfowl. Few, in comparison, are seen nowadays—but this may be due to the poultry disease (known as Ranikhet disease) having become endemic in the jungles, as it is in the villages they surround.

We are still a long way from understanding the reasons for the migrations, temporary or permanent, of animal species. First mange and later rabies caused wild dogs to disappear from these areas for about a year each time, before and during the last war; and no doubt some kind of scourge is generally the cause of temporary extermination of game. But the reasons for the permanent extinction or diminution of species that are not poached is far less easy to understand. In none of the cases referred to can it be said that their food supplies have been affected.

What then is the answer? Our knowledge of animal ecology must be far more profound than at present if we are ever to introduce effective measures for conservation.

HONNAMETTI ESTATE,
ATTIKAN P.O.,
VIA MYSORE (S. INDIA),
10th May, 1949.

RANDOLPH C. MORRIS

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

17.—FREAK SHOTS

Your invitation under this head in the *Journal*, Vol. 48. (i) is bound to prove of general interest.

I give below a few incidents that have come within my experience.

Snipe.

Some years ago the *Field* published a series of articles or letters by contributors which started, by one person claiming to have killed all the birds in a small wisp in one shot, numbering four. This was beaten by another with six, and so on until it reached 9. I met a man, a well-known sportsman, being pig-sticker, angler, and both big and small game shot well above average, who had actually shot eleven, but he would not submit it to the *Field* ! !

Junglefowl.

While shooting driven murgi in the Gorakhpore District of the U.P. one X'mas camp, I had the strange experience of shooting the head and part of the neck off three birds on the same day in a bag of forty odd.

It was close-in shooting in cane and tree cover, with birds passing at close range, and may happen at any time under these conditions, but three times in the same day is freak. My host and two other guests witnessed it.

Duck.

This again is another man's story, but I have been out with him often, and can vouch for its authenticity. The hero of the act was at all times extremely dangerous with his hammer gun frequently carried at full cock and at the trail, ready to warm up the pants of those venturing to walk in front of him in file.

The incident took place in one of the many U.P. tanks with raised banks, covered in grass and bushes and affording cover to the water edge. Some hundred or more pintail duck were seated on the tank, and the shikari crawled through, with the gunman close on his heels and at full cock as usual crawling on hands and knees. As they approached over the crest of the bank and worked down to the water's edge, the shikari had by some act of providence moved to one side when both barrels went off, the triggers being fouled by some obstruction. He picked up seventeen dead and fluttering pintail. 'Was that not lucky?' is all he had to say ! ! !

Chakor.

This, though not a freak shot is a freak pick up !

I was shooting the hill face overlooking Bhim Tal behind the dak bungalow with the beaters spread out on the face above me, but had failed to connect with any of the three small coveys known to be there. I had just watered my dogs at a spring when a shout went up, and a single bird—the only one we had seen that day, came

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

sailing over me, but I clicked two empty barrels as he passed by, and before settling in a heap of boulders half an acre in extent. Determined to get this bird I first worked it with the dogs, and when nothing came out, called the beaters down, but before they arrived my Labrador came round the corner with the chakor in his mouth, alive and fluttering. In my shooting diary I have entered: 'Only one chakor today, and that was caught by "Boy". Aktar the shikari thinks he is the best dog that has ever been up here.'

Mixed Bag.

I have shot a quail and Luggar Falcon in the same shot. I shot at the quail and the falcon arrived as they usually do, with incredible speed from the sky just as I fired, and both dropped about five yards from each other.

A tiger and an old solitary boar with a right ant left in the C.P. was another unusual mixture.

CALCUTTA, A. ST. J. MACDONALD

15th June, 1949.

18.—GLEANINGS

The 'thorn' or 'claw' in panthers' tails.

With reference to Mr. Boswell's note in the *Journal*, Vol. 47, p. 716, it might be interesting to note that G. C. Shortridge in 'Mammals of S.W. Africa', p. 85, writes:

> 'The so-called claw at the end of a lion's tail is usually no more than a small horny scale attached to the skin at the tip of the last vertebra. There are better-developed terminal 'claws' on the tails of the Nail-tailed Wallabies—*Onychogale* and on the Marsupial Rabbit—*Thallacomys lagotis*, that of the latter being pointed, slightly curved and not unlike the sting of a scorpion.'

Bat Migration.

> 'In the city of Chengtu (W. China) I am astonished at the multitude of small bats I see every evening flying south (September 1869), as if these little mammals were also on a voyage of migration towards Southern regions' (Pere David's Diary, Fox's translation p. 298).

Hibernation of Nightjars.

On p. 45 of volume 50 of the 'Condor' there was a note by Edmund C. Jaeger recording the finding of an American Nightjar (*Phalaenoptilus nuttallii*) in a state of torpidity in a niche in a rock in the cold weather. This was handled for some time but then flew away.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

In the May/June issue, volume 51, pp. 105 to 109, there is an extraordinary account of the same bird found in the identical place on 26th November 1947. After this, the place was visited every week until 22nd February 1948 (85 days) on which occasion it flew away on handling. Rectal temperatures were recorded and varied between 18.0 and 19.8 C, while the air temperature was between 17.5 and 24.1 C. During all this period the bird was presumably in a dormant condition. There is a photograph of the bird lying on a man's hand with its head laid across its back and apparently fast asleep.

On 24th November 1948, the bird was back again in a similarly dormant condition but disappeared on the 19th December apparently having been disturbed.

19.—'AGGRESSIVE DEMONSTRATION BY RUSSELL'S VIPER'

I admire the way in which Mr. V. M. Vasu in Vol. 48 No. I of the *Journal* corroborates Mr. A. A. A. Fyzee's note in Vol. 47 No. 2 at pp. 388-89; and by giving an emphatic statement of his personal experience with a Russell's Viper (*Vipera russelli*) near Navibunder on the west coast of Kathiawar (Saurashtra). I confess that I am not an expert on snakes apart from the fact that my Arab watchman used to present me with an odd hundred snakes killed by him during the year from my garden compound in Bhavnagar, which I tried to identify to the best of my ability; amongst these at no time do I recollect having seen a Russell's Viper. In fact I have not heard of, or seen a Russell's Viper in any part of Kathiawar although it *may* occur somewhere. My recent visit to the Navibunder area, at the mouth of the Bhadar River, made me feel that that would hardly be the proper place to harbour a Russell's Viper, however small it may be, on account of its almost barren and semi-desert terrain. I am, myself, inclined to believe that what Mr. Vasu saw, must have been the Common Saw-scaled Viper (*Echis carinata*) which gives out a hissing, or in my own words, a fizzing sort of sound, created by the friction of the scales rubbing on each other, when disturbed. However, I am now very much interested to know whether any reader or person has any authentic record of Russell's Viper (*Vipera russelli*) in Kathiawar (Saurashtra) and if so, from where.

BHAVNAGAR,
SAURASHTRA, K. S. DHARMAKUMARSINHJI
2nd June, 1949.

[We have failed to trace any specimens or authentic records of Russell's Viper occurring in Kathiawar; therefore it is possible that, as suggested above, Mr. Vasu may have confused its identity with *Echis* which is common in that area.—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

20.—A NEW SPECIES OF PIT VIPER FROM SOUTH INDIA: *TRIMERESURUS HUTTONI* SP. NOV.

Description of the type. Snout sharp, distinctly upturned, its edge continuous with the equally sharp canthus rostralis. Upper head scales unequal subimbricate, some of them obtusely keeled, 10 or 11 in a line between the supraoculars; these are narrow and entire but have their inner margins indented by the adjacent scales; internasals not twice as large as the adjacent scales, separated from one another by two small scales; supralabials, the first entirely separated from the nasal, the third much larger than the others; temporals strongly keeled.

Scales in 21 : 23 : 19 rows, indistinctly keeled on the posterior part of the body. Ventrals 146; anal entire; subcaudals 52 pairs.

Colour Green above, paler on the sides, with a distinct series of dorso-lateral, paired, small, white spots; pale green below; a white temporal streak, edge with red below; it is continued forwards in front of the eye; tip of snout and end of tail dull red.

Total length 138, tail 40 mm.

The paratype agrees well with the type. It has a single scale between the internasals; there are 8 scales in line between the supraoculars, ventrals 139 subcauds 49. Total length 139, tail 41 mm.

The sharp upturned snout of this new species of viper gives it a resemblance to the Malayan *T. borneonsis;* in general scalation, except for the separation of the first labial from the nasal, it is related to *T. erythrurus.*

Trimeresurus huttoni is described from two juveniles, both evidently belonging to the same brood. They were captured together in the High Wavy Mountains, Madura District, South India; altitude 5,200 feet, by Mr. Angus F. Hutton, after whom I have much pleasure in naming it.

The type has been presented to the British Museum (Natural History), and the paratype has been retained by Mr. Hutton for his own collection.

British Museum (Natural History),
South Kensington,
London,
2nd April, 1949.

MALCOLM A. SMITH

21.—NOTES ON A SECOND SPECIMEN OF THE SKINK *DASIA SUBCAERULEA* FROM SOUTHERN INDIA

Dasia subcaerulea has until now been known from a single specimen caught at Bodinaikkanur (Madura District) altitude 1,100 feet, and described by Mr. G. A. Boulenger in 1891. Mr. Hutton has now obtained a second specimen from the High Wavy Mountains, altitude 5,900 feet, and about 10 miles S. E. of Bodinaikkanur.

Except that the pre-anal scales are not enlarged, it agrees well with the description of the type, so that the resemblance of

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

this species in scalation to the Indo-Chinese-Malayan *D. olivacea* is more complete than before.

In general colouration it also agrees, except that the two black sreaks upon the neck of *subcaerulea* are never present in *olivacea*.

The digits of the type of *subcaerulea* are shrivelled as I have stated in my description (Fauna Brit. India, p. 278). This is due to desiccation.

The digits of this second specimen are also unfortunately damaged, the result of being burnt. It was caught on the ground after a forest fire. Those sub-digital lamellae, however that are still undamaged, are enlarged basally, and suggest that this species like its ally has aboreal habits.

When caught Mr. Hutton's specimen was light greenish-yellow in colour above with black and white spots as in the type. This colouration has now disappeared, and the specimen is dark brown above, so dark that the spots are hardly visible. The appearance is of a specimen that at some time has been placed in formalin.

It is considerably larger than the type having a length of 70 mm. from snout to vent; most of the tail is missing.

This specimen has also been presented to the British Museum (Natural History).

BRITISH MUSEUM (NATURAL HISTORY)
SOUTH KENSINGTON, MALCOLM A. SMITH
LONDON,
3rd March, 1949.

22.—EGG-LAYING BY THE INDIAN PYTHON IN CAPTIVITY

The December (1947) number of the *Journal* has a note by me on the breeding of the Indian Python. That note records that on 9 June 1947 a pet python of mine laid sixteen eggs; no male python had been (and has been) in the cage since 28 March 1938. Further information:—

On 6 June 1948 the same python laid twenty eggs, thirteen of them being of normal size and colour. These were 8½ inches measured round the centre, and 10½ inches round the ends.

On 5 June 1949 the same python laid eighteen eggs, twelve of them being of normal size and colour. These were 8½ inches measured round the centre, and 10 inches round the ends.

The eggs that were not normal were only about half the size of the others, hard, discoloured, dirty brown and sausage-shaped.

LOYOLA COLLEGE,
MADRAS, C. LEIGH, S.J.
6th June, 1949.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

23.—A POSSIBLE CAUSE OF BLANK DAYS WHEN MAHSEER FISHING

There is still much to be learnt about the classification and distribution of Mahseer and Bokar (Catli) in India. Also about the habits of these fish. But a very pressing question, of interest to sportsmen and scientists alike, is the still apparently unsolved problem of what is the cause of blank days at fishing, when the conditions appear to be good. Blank days, euphemistically styled by anglers as the 'glorious uncertainty' of fishing, and dismissed by others as a futile waste of time, frequently occur when all the accepted conditions of mahseer fishing are favourable. On these occasions, as every fisherman knows only too well, fish just won't bite.

In Assam I have often found that there are certain days when mahseer and bokar cannot be caught, in spite of several baits being tried. Sometimes they don't move at all. Other times they can be seen following the spoon, only following. Rarely they follow too close, and become foul-hooked. Then perhaps a red-letter day, and fish take well, almost any kind of bait. The conditions of these two types of day appeared to be the same. Why then the difference?

Most anglers in India agree that the following conditions are required for a good day's fishing:—

(1) Clear sky, free of rain and thunder.
(2) Clear water, not coloured.
(3) River not too low.
(4) Temperature not too low.
(5) No wind.
(6) Moon not full. (Opinion not unanimous on this point.)

About thunder, Mr. Macdonald himself seems (in his book 'Circumventing the Mahseer') to find the result variable on thundery days. But his contributor on fishing in the Darrang District of Assam, who is a very experienced angler, says of thunder '. . . good fishing may be had, provided there is no thunder about which seems to send the fish clean off the feed'.

With regard to muddy or coloured water, four out of five anglers seem to be of the opinion that it is useless fishing fly, fly-spoon or spoon when the water is not reasonably clear.

Concerning the moon, Mr. Macdonald does not appear to refer to this factor in his book. But Mr. Conway in his 'Sunlit Waters', I think, was very emphatic about mahseer never taking when the moon is full.

My own theory, not yet proved (but I have hopes), is that presuming the other main factors of the weather and water are favourable, fish go off the feed when the barometer is falling, or is low, and that they come on the feed when the glass is rising. And that they take particularly well *when the glass has been low and starts to rise*. This latter condition would explain the 'mad half hour' often experienced in Britain after (or even during) heavy rain, before a flood comes down. For during a storm, even a thunderstorm, the glass frequently starts to rise.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

indicating the fine weather about to come. Similarly, when it is gloriously fine to all appearances, the glass may be gradually and slightly falling, foretelling wet weather in the near or distant future.

With this theory in mind, I have equipped myself with an altitude barometer, pocket size. I have not yet had time to study this while actually fishing, but during the last few months I have noticed that its rising and falling has no distinct relation to the actual weather at the time, but of course relates to the weather of three or four (or even more) hours ahead. In future while fishing, therefore, if the day is blank I shall refer to the barometer. If it is falling, I shall probably (being a keen angler) persevere just to prove my theory, but will perhaps be fishless. If, on the other hand, I find that the glass is rising, or high and remaining high, then I shall know that the fault is mine and not the fish's, and that I must find a better place or change my tactics.

On Sunday July 10th 1949 I went to a small forest stream nearby, to collect orchids. In case the water might have cleared sufficiently, I took a fly rod, but unfortunately left the pocket barometer at home. It may interest anglers to know that although the water was muddy and visibility only about one foot, I had a very pleasant two hours' fishing, killing 8 mahseer between 1 lb. and 3 lb. on a Hardy's 1 inch fly spoon. It was twice broken by larger fish, as my gut cast was an old one. The mahseer (no bokar were caught) were taking best of all in the middle of the severe thunderstorm which occurred, when the thunder claps were at their loudest (there was no rain). And when I returned to the bungalow, I checked up on my calendar—and it was the day of the full moon. So what? I believe that had I had my barometer with me, I would have noticed the glass rising after being low.

It would be interesting to hear the views of other anglers on the subject. It is said that when the glass is low, the oxygen of the water is diminished, making fish listless. Possibly this atmospheric pressure theory, which I believe is held by others in various parts of the world, may provide the solution of the problem of blank days, and save fishermen a lot of time and wasted energy.

DOYANG T. E.,
OATING P.O., E. P. GEE
ASSAM.

[Mr. A. St. J. Macdonald comments on the above as follows:

'Mr. Gee's note is a worthy contribution to the angler's quandary! It is only by such observation and experiment that progress is made.

The approach is scientific, so "We cry unto thee oh Pundits, Norman, Hora and Arthur Thompson."

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The seasons and elements dictate the laws of Nature: breeding of beasts and birds, germination of seed, and hatching out of insects, in productive continuity; so why not fish?

I am inclined to agree that elemental influence plays a large part in a fish's life, whether feeding or migrating. But whether it be from a lack of (or too much) oxygen; pressure, as Mr. Gee now suggests; or some other indication that fish read in changed conditions in the water or weather, it is closely associated with insect life. We may go a step further into the entomologist's camp! What are the factors that influence the hatching out of beetles and of moths, to take just two? Fish seem to know when to expect them, and will immediately come on the feed with the first arrivals flopping in the water.

I have experienced this so often in the Kumaon lakes, where the surface was dead for most of the day with no fish moving, but the moment the first cockchafer beetle flopped in the water, the surface was alive with feeding fish. This also occurred at other times with white moth, and a large variety of may-fly found up there. Is this also a barometer problem?

On the influence of the moon I have already addressed a letter to the *Journal*, with graphs to illustrate results within my own experience.'

* * * * *

Dr. M. Suter, the well-known angler, writes:

'Mr. E. P. Gee's note touches on a subject which has puzzled most of us fishermen and has left me so after very many years of regular fishing within a radius of 100 miles around Poona.

On the whole I agree to the reliability of conditions 1, 3 and 4 of Mr. Gee's list, but as to condition 2 (clear water, not coloured) I have consistently done better in moderately coloured water than in crystal clear, in which latter fish seem to be more shy and wary of accepting an artificial lure.

Local Indian fishermen, spinning a bunch of green algae or a hook tied between two triangular slices of white coconut flesh in rapid runs catch every year fish up to 25 lb. and over when rivers are in spate and the water quite muddy.

Condition 5 (no wind): Heavy wind is undoubtedly adverse but a light breeze rippling the surface is hereabouts essential for success with the fly, the gram and the unshelled groundnut used dryfly fashion.

I never fished during a thunderstorm but repeatedly observed mass distress amongst fish and sometimes heavy mortality after a violent thunder-and rain-storm.

Whether this is caused by the sudden lowering of the water temperature due to abundant cold rain, or whether the electric phenomena accompanying the storm are involved is not within my knowledge.

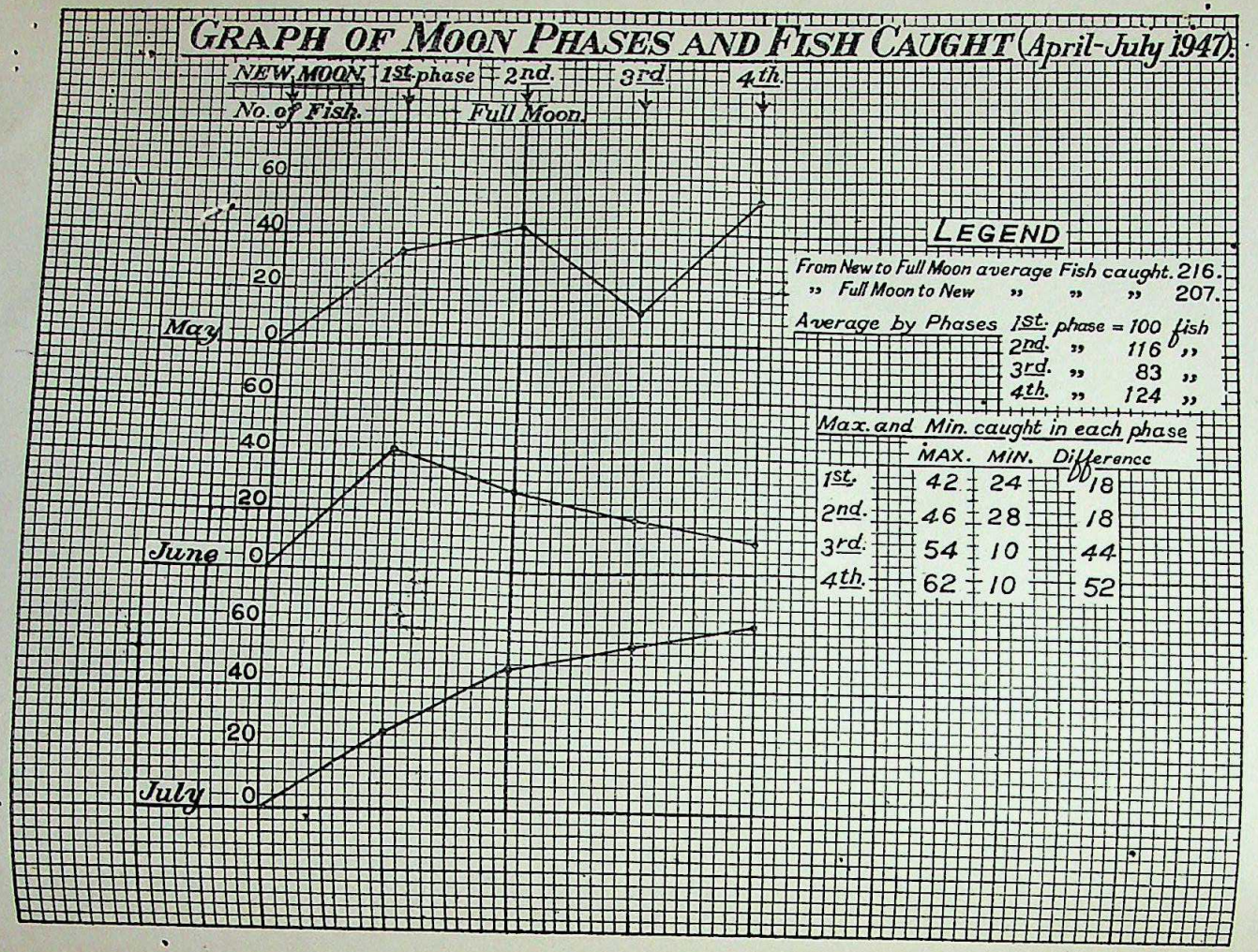
I firmly believe in the influence of atmospheric pressure and am sure that if Mr. Gee will continue his barometric observations very interesting results ought to ensue.

As for the influence of the phases of the moon on the appetite of fishes I have never noticed any and am frankly sceptical about anything of the kind.'—EDS.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar



Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

24.—MOONSTRUCK—FISH OR ANGLERS?

(*With a graph*)

There is a firm belief with some anglers, that the phases of the moon influence the feeding habits of fish. Conway, in his book 'Sunlit Waters' makes reference to this on p. 123, and claims to have kept records over two years which supported his views, but details are unfortunately not given. The localities and seasons would have been interesting.

The theory is generally accepted in the case of marine fishes, so much so, that professional fishermen and anglers alike study the tides as the main factor, but of inland fishes it remains an open question.

As a matter of interest I have prepared a graph of three months results while fishing the Kumaon lakes with unbroken continuity. The period is taken over three lunar months, from April 28th to July 20th 1947.

In all, 423 fish were taken in 72 fishing days. All three lakes were visited regularly and fished in the same way. The fish were all mahseer (*B. tor putitora*) and caught on fly and fly-spoon, with only a few caught during the heat of the day on atta. The results, as will be seen from the graph, are anything but consistent. I wonder if anyone among our members has results to support the theory?

I have personally never attributed any importance to the belief, but on the contrary, selected the full moon period to fit in with a fishing holiday so that it may help with sitting up for tiger, and had satisfactory results with the rod. But we live and learn!

CALCUTTA, A. ST. J. MACDONALD

25th May, 1949.

25.—ON THE CULTURE OF GREY MULLETS IN ASSOCIATION WITH COMMERCIAL CARPS IN FRESHWATER TANKS IN BENGAL

(*With a photo*)

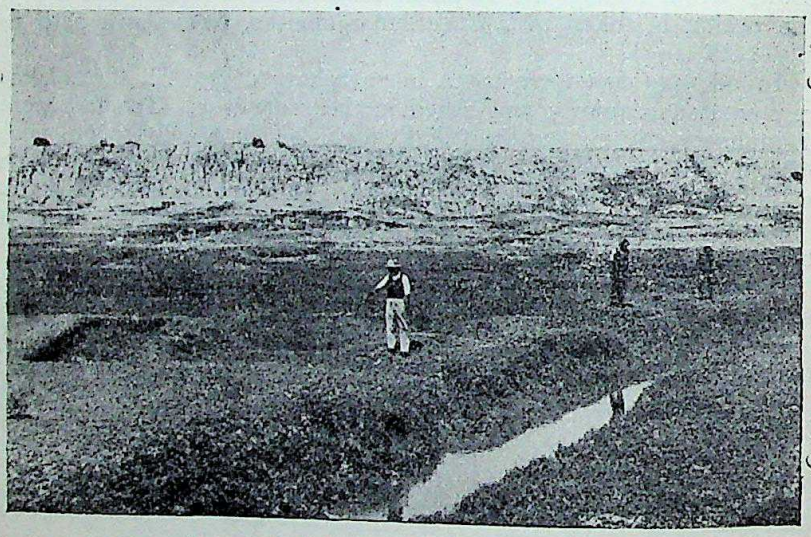
In an earlier article, the writer (Pillay, 1947) indicated the desirability of culturing suitable fish compatibles in mullet farms for a more economic utilization of ponds' fodder resources. Lin (1940) reported the successful practice of culturing carps together with grey mullets in brackish water ponds of Hong Kong and presumed that this practice was probably something new in pisciculture. During an investigation on the biology of *Mugil tade* Forsk. and its culture, which is now in progress, the writer had opportunities to visit some coastal villages on the contai coast (Midnapore District, West Bengal) and study the age-old system of mullet culture in freshwater tanks in association with carps practised in this area. In view of Lin's remarks quoted above, it is considered necessary

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

to place on record the information thus collected regarding this very interesting system of mixed fish farming.

The general preference for freshwater fish for the table is widespread in Bengal, and even the sea fishing centres form no exception. Culture of carps is, therefore, undertaken in freshwater tanks even in the coastal region of Contai. Carp spawn is not available locally, and the fishermen have to obtain their supplies from the Balasore area in Orissa. Due to the distance and transport difficulties, the outlay needed to secure spawn is comparatively high. The mortality during transit is also very high, so much so that an average tank in this area remains understocked as far as carps are concerned. But the resourceful fishermen have found it advantageous to stock them with an adequate number of grey mullet fry, to increase the yield from their tanks. Mullets



A typical collecting centre for mullet seed

are greatly esteemed in the locality, more so when caught from freshwaters. The fact that they grow very rapidly in freshwaters (Hora and Nair, 1944) has been well realised by the fishermen and so their culture in tanks is very popular. The main species utilized for culture are:—Ainj (*Mugil cephalus* Linn.), Dhoka (*M. tade* Forsk.) Kannua[1] (*M. corsula* Ham.), Parsia (*M. speigleri* Blkr.), Khorsla[1] (*M. parsia* Ham.), the first three species being preferred because they grow rapidly and attain a large size within a comparatively short period. Mullet culture in freshwaters is in vogue in Madras also (Job and Chacko, 1947).

Along the Contai coast, there are numerous narrow tidal streams and creeks, and connected with these are several borrow pits dug for the construction and repairs of the sea-dyke guard-

[1] In other parts of Bengal, *M. corsula* is known as khorsula and *M. parsia* as parsia.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ing the coast from the tidal storms of the Bay of Bengal. These streams, creeks and pits form the important source of mullet seed for culture. The accompanying photograph shows a typical collecting centre at Baguranjalpai—a village near Contai. The high water brings with it numerous fry ranging from ¾ inch to 2 inches size, and when the tide recedes a good number of them remain in the borrow pits and pools. The fishermen collect these, by means of fine-meshed dip nets. Pieces of cloth (gamcha) are also employed sometimes for the purpose as described by Basu (1946). The fry thus captured are transported in earthen handies, in the same manner as carp fry. Though mullet fry are available in the area for at least 6 months in the year, different species predominate at different periods. Fry of Ainj (*M. cephalus*) and Parsia (*M. speigleri*) are available during March-April and Khorsla (*M. parsia*) from October to November. Dhoka and Kannua fry (*M. tade* and *M. corsula*) are abundant in July-August. The fry thus obtained are directly introduced into freshwater tanks. The fry collection centres being very near to the tanks, there is practically no mortality during this transference.

No artificial feeding or manuring is done here, but despite this the growth of mullets in the tanks has been found to be very encouraging. The growth rates of different species reported by the fishermen, are as follows:— In an average tank, *M. cephalus* grows to about 16 inches in one year and attains a weight of about 5 to 6 lb. in two years' time....*M. tade* introduced in July-August attains only about 6 inches to 9 inches by the end of the first year but it grows more rapidly in the second year and weighs about 3 to 4 lb. at the end of it. *M corsula* measures 4 to 5 inches in the first year and reaches 14 to 18 inches in about 3 years. *M. speigleri* and *M. parsia* do not grow to a very big size and usually they are fished out at the end of the first year when they measure about 5 to 6 inches. Mullets feed near the margins of the tanks and do not interfere with the normal feeding of carps. Being non-predaceous, they do not affect the growth and well-being of each other. Thus it appears that carps and mullets form suitable associates in ponds in coastal and estuarine areas in India also as in China, and mixed farming on these lines may be well worth popularising.

Another aspect revealed by this age-old practice is that the laborious process of acclimatization and conditioning (Devanesan and Chacko, 1943, and Venkataraman, 1944) may not be necessary if small fry collected from creeks and backwaters are to be used for stocking and the seed is not to be transported to very distant places. During a recent visit to the Sir Daniel Hamilton's Estate in Gosaba (24 Parganas, West Bengal) it was found that *M. tade* are directly introduced into tanks in the fingerling or more grown-up stages from Bheris, without any appreciable mortality. Spurgeon (1947) has shown that they ascend freshwater courses from estuaries and get naturally acclimatised. The popular practice of allowing mullets to graze in freshwater in paddy fields (Hora and Nair 1944) also lends support to this view.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

The writer's grateful thanks are due to the National Institute of Sciences of India for the award of an I.C.I. (India) Research Fellowship which provided the opportunity to observe this interesting practice.

ZOOLOGICAL SURVEY OF INDIA LABORATORIES,
CALCUTTA, T. V. R. PILLAY

21st July, 1949.

REFERENCES

1. Basu, S. P. (1946): Possibilities of Mullet culture in India. *Indian Farming*, 7 (II): 517-522.

2. Devanesan, D. W. and Chacko, P. I. (1943): Possibility of culture of certain marine mullets in freshwater tanks. *Proc. Nat. Inst. Sci. India* ix, (2): 249-250.

3. Hora, S. L. and Nair K. K. (1944): Suggestions for the development of Salt water Bheris or Bhasabhada Fisheries in the Sunderbans *Fishery development pamphlet No.* 1, *Dept. of Fisheries*. Govt. of Bengal, Calcutta.

4. Job, T. J. and Chacko, P. I. (1947): Rearing of salt water fish in fresh waters of Madras. *Indian Ecologist* 2 (I): 1-9.

5. Lin, S. Y. (1946): Fish Culture in ponds in the New Territories of Hong Kong *Journal of the Hong Kong Fisheries Research Station*. 1 (2): 161-193.

6. Mookherjee, H. K., Ganguly, D. N. and Sircar, A. (1946): On the composition of food of the Indian Mullet *Mugil parsia* (Ham.) with suggestion to culture them in fresh-water ponds of Bengal. *Proc. 33rd Indian Sci. Congr.*, pt. 3 (7) p. 16.

7. Pillay, T. V. R. (1947): Possibilities of Mullet Culture in India. *Indian Farming* November 1947: 544-548.

8. Spurgeon, V. D. (1947): Natural acclimatisation of two species of mullets *Mugil dussumieri* (C.V.) and *Mugil oeur* (Forsk.) to freshwater conditions on the Nellore Coast. *Curr. Sci.*, 16, (4): 123-124.

9. Venkatraman, R. S. (1944): Acclimatisation of salt water mullet *Mugil seheli* to freshwater. *Curr. Sci.*, 13 (9): 139.

26.—SOME OBSERVATIONS ON *APLOCHEILUS LINEATUS* (CUV. & VAL.) IN MADRAS PROVINCE *

The Top-minnow, *Aplocheilus lineatus*, occurs in South Kanara, Malabar and Tirunelveli districts. The maximum size of the fish so far recorded is 9.5 cm. Its food is found to consist of corixid bugs, small beetles, water mites, insect larvae including mosquito larvae, ants, phytoplankton (*Merimopedia*, *Spirulina*, *Crucigenia*, *Mougeotia*, *Amphora*, *Cyclotella*, *Melosira*, *Pinnularia* and *Synedra*), and zooplankton (*Euglena*, *Phacus*, *Diaphanosoma*, *Ceriodaphnia*, *Diaptomus*, *Cyclops*, *Eucyclops* and *Nauplius*). When reared in aquaria, the fish is found to consume young *Gambusia*, *Lebistes* and carp fry. It also thrives well on prawn-shell meal, earthworms and other artificial food. It is very active and agile, and has been observed to jump over a two-foot wall of a garden pond. The fish is thus mainly insectivorous; and is suitable for control of mosquito larvae. Its larvicidal propensities have already been reported by

* Communicated with the kind permission of the Director of Industries and Commerce, Madras.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Bently[1], Deraniyagala[2], Fraser[3] and John[4]. In the laboratory of this station, a single specimen of the species was observed to feed on 270 mosquito larvae in 24 hours. The fish attains maturity when 50 mm. in size. Its breeding season extends throughout the year with a maximal from August to September. Our observations on the breeding and early development of the species do not show considerable variations from those of Job[5] and Jones[6].

A very remarkable feature about the fish is its occurrence in all types of water such as hill-streams and reservoirs at high altitudes, rivers, tanks and wells of the plains, low-lying paddyfields and swamps, and estuaries and backwaters. It is hardy and is able to adapt itself quickly from one type of environment to another. It thrives even in foul waters containing sulphuretted hydrogen and red sulphur bacteria. For example, it is found to occur in the Hope Lake located at about 700 feet above sea level. The water in this lake is highly oxygenated, soft and slightly acidic with a pH of 6.3—7.5; and has very low calcium and chloride content (0.7 p.p. 100,000). The fish is also seen in the stagnant pools in the course of the Tambraparni river below the lake. It is found in abundance in the Periyar Reservoir situated at an elevation of 3,000 feet. The water in it is soft, acidic and very low in calcium and chloride content. The occurrence of the species has been noted in the upper reaches of the Mannantoddy river at an altitude of 2,000 to 3,000 feet, whose waters are highly oxygenated, soft and acidic (pH—6.7), with very low calcium and chloride content (0.5 p.p. 100,000). The fish occurs in almost all tanks, ponds, wells, fields and swamps in the plains of Malabar, in which the ecological conditions vary from place to place. In the Coondapur estuary, where the chloride content is over 2,000 p.p. 100,000 and pH 8.0, the minnow is found in large numbers. In Dr. Rai's estate near Mulky, the minnow is found under interesting conditions. Sea water enters into the estate through the Pollai canal and fills up one of the ponds during high tide. This salt water pond is connected to a freshwater pond through a small channel. The fish was found in both the ponds and freely moving from one to another. The chloride content and pH of the ponds were 1250 and 7.9 and 610 and 7.5 respectively. The fish is also found in the creeks of the Cochin backwaters containing red sulphur bacteria and where the pH and chloride content are about 7.9 and 2,000 p.p. 100,000. The oxygen content is less than 1. occ/1. The fish is thus unaffected even by adverse environmental changes.

FRESHWATER BIOLOGICAL STATION, P. I. CHACKO
KILPAUK, MADRAS, S. V. GANAPATI
July 1949.

REFERENCES

1. Bentley, C. A. (1910): *J. Bom. Nat. Hist. Soc.*, **20**: 392.
2. Deraniyagala, P. E. P. (1930): *Ceylon J. Sci.*, **2**: 191.
3. Fraser, A. G. (1938): *J. Bom. Nat. Hist. Soc.*, **40**: 96.
4. John, C. C. (1940): *J. Mal. Inst. India.*, **3**: 67.
5. Job, T. J. (1940): *Rec. Indian Mus.*, **42**: 51.
6. Jones, S. and Job, T. J. (1940): *J. Bom. Nat. Hist. Soc.*, **42**: 203.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

27.—FOOD ORGANISMS OF THE CARP *LABEO BOGGUT* (SYKES) *

Labeo boggut is one of the common carps of the Tungabhadra and Krishna drainages. It breeds during the flood season (July to October) when its juvenile stages occur in large numbers. Though growing to a size of about eight inches only, the easy availability of its seed makes it a valuable addition for stocking inland waters.

The following is a table of the food organisms and their frequency of occurrence in 100 specimens of the fish collected from the Tungabhadra river near about Sunkesula village in Kurnool district, in the months of May, June and July 1948.

Kind of food organism	No. of stomachs containing organism	Average % volume in all stomachs	Greatest % in any stomach
MYXOPHYCEAE:			
Anabaena ...	14	2	10
Aphanocapsa ...	12	2	10
Coelosphaerium ...	4	—	—
Lyngbia ...	28	5	25
Merismopedia ...	47	12	30
Nostoc ...	18	3	20
Oscillatoria ...	51	18	75
Spirulina ...	22	4	10
BACILLARIEAE:			
Achnanthidium ...	2	—	—
Amphora ...	3	—	—
Cocconeis ...	13	—	5
Cyclotella ...	39	1	5
Cymbella ...	14	—	—
Eunotia ...	79	10	20
Fragilaria ...	84	12	25
Frustulia ...	4	—	—
Gomphonema ...	76	5	20
Gyrosigma ...	42	2	12
Mastogloia ...	31	2	10
Melosira ...	46	2	10
Navicula ...	9	—	—
Nitzschia ...	56	7	20
Pinnularia ...	6	—	—
Pleurosigma ...	6	—	—
Stauroneis ...	8	—	—

* Read before the zoology section of the 36th Indian Science Congress, 1949; and communicated with the kind permission of the Director of Industries and Commerce, Madras.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Kind of food organism	No. of stomachs containing organism	Average % volume in all stomachs	Greatest % in any stomach
Surirella ...	4	—	—
Synedra ...	67	2	10
Tabellaria ...	42	2	10
CHLOROPHYCEAE :			
Ankistrodesmus ...	45	4	20
Closterium ...	66	5	25
Cosmarium ...	8	—	—
Desmidium ...	37	2	5
Euastrum ...	1	—	—
Microspora ...	15	2	5
Mougeotia ...	37	12	35
Oedogonium ...	81	15	40
Oocystis ...	5	—	—
Pediastrum ...	26	2	5
Pleurotaenium ...	17	7	20
Scenedesmus ...	32	2	10
Spirogyra ...	72	30	80

The fish chiefly browses on algal matter and on the bottom scum. Diatoms and desmids also enter its food as minor items. It is noteworthy that animal matter is totally absent in its diet. This is the first record of the food and feeding habits of this species.

FRESHWATER BIOLOGICAL STATION, P. I. CHACKO
KILPAUK, MADRAS, (MISS) SHARADA SUBRAMANIAN.
May 1949.

28.—A REMARKABLE ABERRATION OF *A PAPILIO POLYTES ROMULUS* CRAM

(*With a photo*)

I have pleasure in sending you two photographs illustrating the upper and under sides of an aberrant specimen of a *Papilio polytes romulus* Cram. collected by Mr. A. Bell at Jeolikote below Naini Tal at about 5,000 feet elevation.

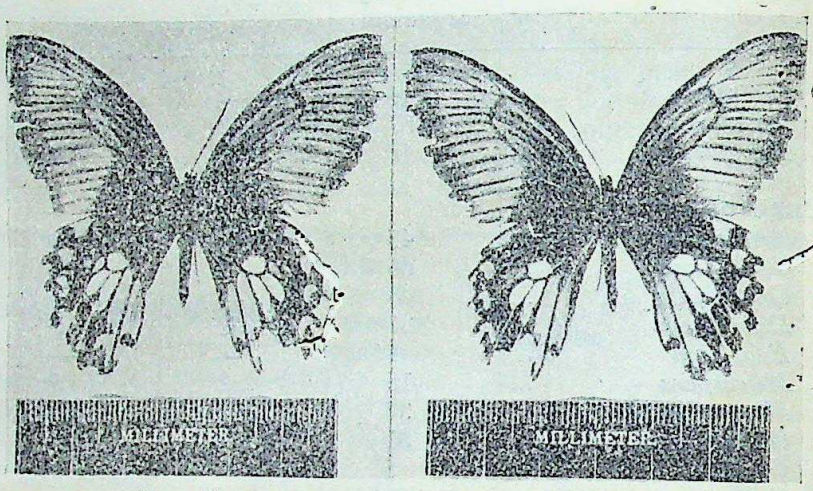
The following is a brief description of this specimen very kindly furnished by Mr. A. G. Gabriel of the British Museum, to whom the specimen was presented:—

Upperside. Forewing normal. Hindwing: a white marking edged with buff-coloured scales occupying the apical third of the discoidal cell, and white elongate markings in interspaces 2 and 3 beyond

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the cell; two elongate buff-pink markings in interspaces 1/b and 1/c; the submarginal spots also buff-pink; marginal lunules white as in the typical form.



Upperside Underside

Underside. The markings are similar in colour and position to those on upperside.

This remarkable aberration appears to be unique and there is nothing like it in the collection of the British Museum. Brigadier W. H. Evans, who saw the specimen, said that he had never come across anything like it.

Very unfortunately the butterfly was in much tattered condition when caught.

The photographs were also supplied by the British Museum.

116, Koregaon Park,
Poona,
14th July 1949.

M. SUTER, D.SC.

29.—THE EGG MASS OF A DOLIID GASTROPOD MOLLUSC FROM KRUSADAI ISLAND

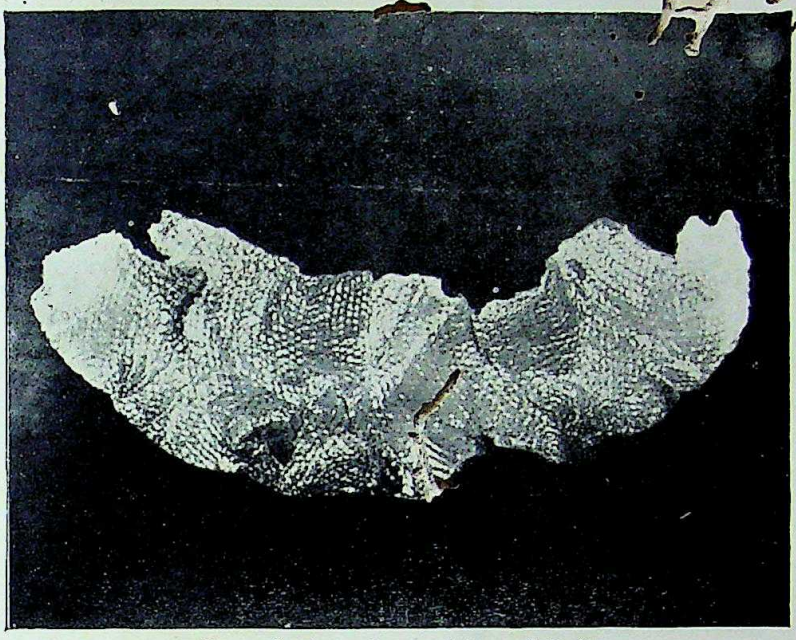
(*With a plate*)

During a visit to Krusadai Island in 1947 we found a few gelatinous ribbons washed ashore at Kundugal point on 25-2-47. On examination, these proved to be the egg masses of a gastropod mollusc. In addition to the fresh spawn mass in which the embryos were alive, there were four other ribbons which on account of exposure to the sun had become tough and leathery, superficially resembling the cast skin of snakes.

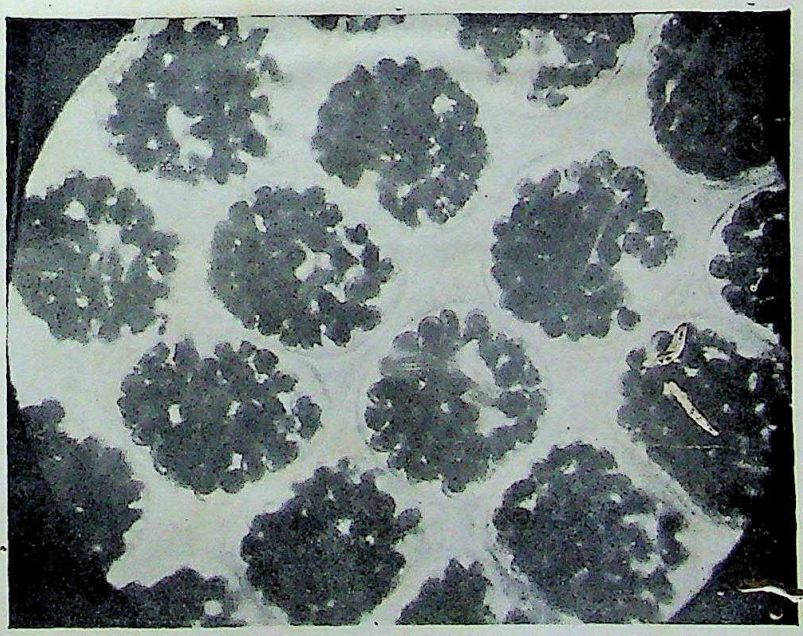
The spawn masses were brought to the laboratory and kept alive for three days. The ribbons were from 250 to 380 mm. long, 60 to 70 mm. wide with a wavy margin and a thickness

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri



1. General view of egg-ribbon of *Dolium* sp.
(Specimen incomplete—broken during preservation)



2. A few of the capsules enlarged showing the numerous veligers inside.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

of about 1.5 to 2 mm. Inside each ribbon were numerous transverse rows of 28 to 34 capsules arranged in curved rows (photo 1). Each capsule was oval in shape, of an average diameter of 2 to 3 mm. and with a wall of fibrous texture and having a round aperture on the surface. On an average 75 to 85 veligers were found inside each capsule except in those which were empty. Most of the veligers were in the early stages of development but clearly showed sculptured shells of a brown colour. An operculum and a velum consisting of several lobes were also present.

Subsequent examination of the material was not possible as the veligers died and the material remained unidentified. Inquiries at Krusadai revealed that similar spawn masses were not previously recorded from that area; nor are there any descriptions of similar egg masses in Hornell's Common Molluscs of South India.[1]

A comparison of the description and figures of the egg mass of *Dolium* (? *maculatum* Lam.) from the Iranian Gulf given by Thorson[2] with our notes and illustrations and the preserved spawn brought with us leave no room for doubt as to the identity of our material. The Iranian egg mass was 300 mm. long, 90 mm. wide and 2 mm. thick with curved rows of capsules numbering about 30 across the ribbon, each capsule containing 91 to 101 embryos, a number much larger than in our material. These broad gelatinous ribbons without sand incrustations are said to be characteristic of the genus *Dolium* and were first described by Lo Bianco[3] from the Mediterranean. From the dried ribbons we have been able to make out that in the early phases, the eggs inside the capsule are distributed in a semilunar mass as described by Thorson and, presumably, when the eggs develop, they spread out and occupy the whole cavity of the capsule (photo 2).

It seems certain that the egg masses which we collected at Krusadai can be referred to a species of the genus *Tonna* (=*Dolium*) but specific identity can be established only by further work. Gravely[4] has recorded four species of Doliids as occurring in South India. These are:—

Tonna dolium (Linnaeus) (=*Dolium maculatum*)
Tonna cumingii (Reeve) (=*Dolium cumingii*)
Tonna fasciata (Lamarck) (=*Dolium fasciata*)
Tonna pomum (Linnaeus) [=*Dolium* (*Malea*) *pomum*]

As there do not appear to be any published photographs of the egg ribbons of Dolium, we feel the accompanying photographs will be of interest.

CENTRAL MARINE FISHERIES, RESEARCH STATION, MADRAS/MANDAPAM,
N. K. PANIKKAR
P. R. S. TAMPI
July 1949.

REFERENCES

1. Hornell, J. (1922): Common Molluscs of South India. *Madras Fisheries Bulletin*, xiv: 97-215.

2. Thorson, G. (1940): Studies on the egg masses and larval development of Gastropoda from the Iranian Gulf. *Danish Scientific Investigations in Iran* Copenhagen, Pt. 2: 159-230 (pp. 192-95).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

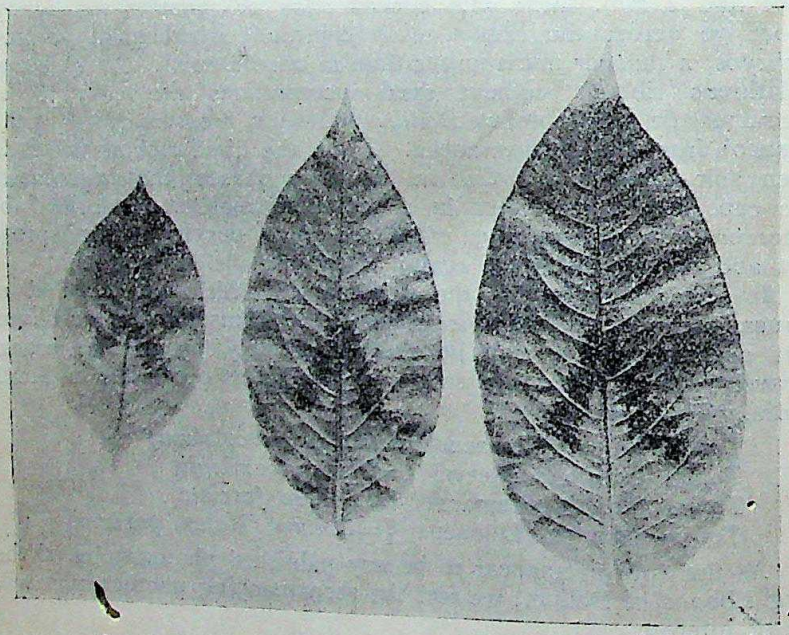
3. Lo Bianco (1888 & 1908): Notizie biologiche riguardanti specialmente il periodo di maturita sessuale degli animali del golfo di Napoli. *Mitth. Zool. Stat. Neapel*, 8: 385-440 (p. 417); 19: 513-761 (pp. 635-36).

4. Gravely, F. H. (1942): Shells and animal remains found on the Madras beach. *Bull. Madras Govt. Mus. Natural History* series II, p. 98.

30.—THE 'VICTORY PLANT'

(With a photo and two text figures)

The leaves of *Polygonum*, as is well known, bear various kinds of marks on their surfaces. One particular species of this genus growing in the departmental garden was noticed to bear on all its leaves a V mark (see photo). Leaves of the same species growing in other places also bear the same mark showing that it is no chance occurrence but a distinctive feature of the leaves.



The V mark is dark brown or dark violet in green leaves. In leaves which have turned pink the mark may be dark green in colour. The point of the V is invariably and without a single exception pointed towards the tip of the leaf. The mark is very definite and conspicuous in green and young leaves. As the leaves grow older and bigger the mark also becomes enlarged, diffuse, fainter and occasionally even irregular in outline. But the essential V form is always maintained. The mark is found only on the upperside of the leaf, never on the lowerside. Dried

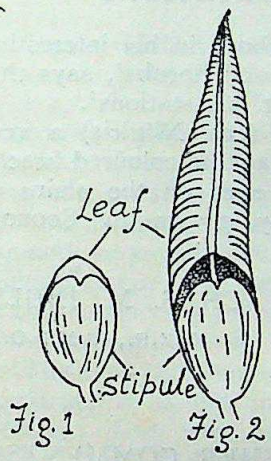
CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

up leaves and herbarium specimens also show the mark, but rather faintly.

In this species a very young leaf is completely enclosed within the stipular sheath; such a leaf does not show the mark. An older leaf which has outgrown the stipule shows the mark faintly, with the stipule adpressed against the upper surface of the revolute leaf. In fact the stipular tip often occupies the bay between the arms of the V mark, almost suggesting a possible connection between the mark and the stipule.

Sections taken through the region of the mark do not show any peculiarity except that certain cells of the palisade tissue only in the marked region show violet coloured cell sap. This probably explains the presence of the mark on the upper-side and not the lower. It is not unlikely that the violet colour of the sap is due to an anthocyanin pigment. Several species of *Polygonum* are known to bear anthocyanin pigment in their leaves (Garjeanne, A., 1903. Buntblätterigkeit bei Polygonum, *Beihefte Botaniscehen Zenteralblatt*, Bd. XIII, s. 203). Wheldale further mentions that anthocyanin pigments occur in the subepidermal region in the older leaves in *Polygonum* (The Anthocyanin pigments of plants, 1916, Cambridge University Press, p. 41). It is worth noting that although all the leaves bear the V mark, the leaves are all not green in colour, the colour varying from green to pink and red, in the same plant. This is very suggestive of widespread anthocyanin activity.



How exactly the V mark arises is not clear. A possible explanation is this. The young leaf at first is fully protected within the stipular sheath. When it outgrows the stipule in its development a portion of the young leaf is exposed to light as in fig. 1. This exposed area develops the pigment probably as a chromatic adaptation to light. Then the rest of the leaf grows up perhaps at a very rapid rate, without there being any necessity for further chromatic adaptation. But the area that has already developed the pigment retains it as in fig. 2.

The most interesting point about the V mark as compared with other kinds of marks on the leaves of *Polygonum* is its astonishingly constant occurrence, definiteness and disposition. Evidently it is one of those characters that are transmitted from generation to generation—a mendelian character. So far as I am aware the presence of this mark on the leaves of *Polygonum* has not been clearly or adequately mentioned in any of the standard taxonomic works, although it has been figured on the leaves of *P. persicaria* var. *genuinum* (Sowerby's Botany, edited by J. T. B. Syme, Vol. 8. pl. 1237) and *P. alatum* (P. F. Fyson, Flora of the Nilgiri and Pulney hilltops. Vol. 3, p. 473).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Quite a lot of amusement was created when the leaf was exhibited as the *Victory Leaf*—at the conversazione held during the Convocation week in January 1948—during India's first year of independence. In fact the plant has come to be better known amongst students as the *Victory Plant* rather than as *Polygonum*!

DEPARTMENT OF BOTANY AND GEOLOGY, A. R. RAO
UNIVERSITY OF LUCKNOW,
LUCKNOW,
1st September 1948.

31.—BOUGAINVILLEAS AT HILL-STATIONS

Dr. N. L. Bor, when dealing with the above in his interesting articles on 'Some Beautiful Indian Climbers and Shrubs', says that they will grow almost anywhere 'except at hill-stations'.

There is in Ootacamund (elevation 7,400 feet, Nilgiris) a very fine specimen which is just now a mass of magenta-coloured bracts. It is as beautiful as most of those I have seen on the plains or elsewhere. Several varieties are commonly grown in Coonoor (elevation 6,000 feet) and do quite well.

KENILWORTH, CHAS. M. INGLIS
COONOOR, NILGIRIS, F.Z.S., C.M.B.O.U.
29th April 1949.

32.—THE GENUS *CEROPEGIA*: FURTHER COMMENTS*

In a recent note published in the *Journal* (**47**: 775—777, 1948) the writer remarks 'It is somewhat astonishing then, that Hooker was able to identify his own plant as being the *C. odorata* of Nimmo'. But the writer has not mentioned any of Hooker's specimens which Hooker, according to the writer's statement, must have used as the type material to base his description. Instead of Hooker citing his own specimen as the type of his species, he cites only Nimmo's sheet from Salsette, besides another of Law in Hooker's 'Flora of British India,' iv, p. 75. It is, therefore, unambiguously clear that Hooker had seen Nimmo's specimen and that of Law, to serve him the material for describing the species as otherwise, an elaborate description like the one he has given in the Flora of British India (vol. iv, p. 75) is impossible. If Nimmo's sheet was not available for him, he would have quietly omitted the Nimmo's species under *species dubia* as is usual with him. I, therefore, contend that Hooker f. has seen Nimmo's sheet and has described it fully from that type. Its absence from the Hookerian Herbarium does not preclude its presence elsewhere. Nimmo collected this plant long before the Kew Herbarium came

* The material for the note was gathered during the writer's stay at the Calcutta Herbarium in December 1948.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

into existence, and it is quite possible that the type of Nimmo is not in Kew and may be present in some other herbarium.

Unless and until it is definitely known that Nimmo's Salsette specimen does not exist anywhere except in the fertile brain of Joseph Hooker, Hooker's description of Nimmo's name, '*Ceropegia odorata* Nimmo ex Hk. f.' should be recognised as having been validly published.

DEPT. OF BOTANY, R. SESHAGIRI RAO
P.R. COLLEGE,
COCANADA,
8th May 1949.

33.—THE GENUS *CEROPEGIA*: STILL FURTHER COMMENTS

None of the authors who have been writing on the flora of Bombay since the publication of Graham's Catalogue in 1839, with the possible exception of Hooker, has seen the type of *C. odorata* Nimmo. Cooke, who wrote his Flora under the watchful and very sensitive eye of Dr. Hooker, failed to see not only Nimmo's type, but apparently any other sheet of this species, and in consequence he omitted *C. odorata* Nimmo from his book. These omissions call for an explanation.

The type of Nimmo's plant is not found in Hooker's or Wight's herbaria; it is not in the British Museum, nor in the Linnean Society; if it were in the Calcutta herbarium we should have heard about it long ago. My contention is that until the type be produced, no one can identify Nimmo's plant for a certainty, and therefore his binomial must remain a *nomen dubium*; moreover, if Nimmo's plant remains doubtful, its identity with Hooker's plant must likewise remain uncertain.

Much emphasis is laid on the fact that Hooker in his Flora mentions 'Nimmo's sheet from Salsette'. Graham in his Catalogue, after No. 898, writes: 'Three new species, discovered by Mr. Nimmo, in the Concans'. The first of these three species of Graham is *C. odorata* N. In the absence of the proper herbarium sheets, I consider this reference of Graham as the source from which Hooker derived his information as regards Nimmo's plant.

This question could easily be solved if we could find Nimmo's type, but of this I see little hope. Nimmo did not keep a herbarium, nor did he keep any large collection of Bombay plants. In the extensive correspondence of Nimmo kept in Kew herbarium there is no mention of such a collection; moreover, in the course of two years spent in Kew herbarium I went through most of the Indian plants; Hooker's and Wight's private herbaria are included therein; and were carefully examined; in all I found about 5 or 6 plants from Nimmo, and none of these is the type in question.

Nimmo's description of the plant is too short and too vague; until his type be produced, the identity of his plant with that of Hooker will remain doubtful. Provided such an identity can be

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

established satisfactorily, then it is correct to write '*Ceropegia odorata* Nimmo ex Hook. f.'; *but the crux of the matter is precisely in proving such an identity in the absence of the type.*

St. Xavier's College,
Fort, Bombay.

H. SANTAPAU

34.—MASS FLOWERING OF *STROBILANTHES KUNTHIANUS* ON THE HIGH WAVY MTS., IN AUGUST 1948.

Last year the whole of the grassy eastern and western facing slopes of the High Wavy Mts., above 5,000 feet were covered in a mass of blue flower, during the month of August. According to eye witnesses the mass flowering was very even throughout the area, and continued up to over 6,000 feet. The last mass flowering was in August 1936. Last year's flowering, however, covered a far greater area than before as *Strobilanthes kunthianus* has spread over many areas where it did not previously exist. A few odd plants have flowered in odd years here and there, but in August 1946 I came across a patch about two hundred acres in area which was a sheet of blue. This patch was in the extreme south-west of these hills, and was surrounded on all sides by *Strobilanthes* which was not flowering.

It is curious that a patch like this should be two years earlier than the rest. I do not know whether this same patch was two years earlier than the 1936 mass flowering or not, but it will be interesting to see what it does in 1958.

Injiparai Estate,
Valparai P.O.,
Coimbatore District,
11th May 1949.

A. F. HUTTON

[This accidental flowering of some *Strobilanthes* plants one or two years before the general flowering has been noted for other species of the same genus by Santapau in the *Journal* (**44**: 605, 1944). After the general, there may follow some sporadic flowering for one or more years, and for this reason it may be of interest to keep *Strobilanthes kunthianus* under observation. Exact data about the partial or general flowering of *Strobilanthes* are needed, and readers from various parts of India will be rendering a service if they will communicate to the Society any precise data on the subject.—Eds.]

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

ANNUAL REPORT OF THE BOMBAY NATURAL HISTORY SOCIETY FOR THE YEAR ENDING 31st DECEMBER 1948.

President

H.E. Raja Maharaj Singh

Vice-Presidents

Lt.-Col. Sir Sahib Singh Sokhey, I.M.S.
Mr. W. S. Millard, F.Z.S.

Executive Committee

Mr. Humayun Abdulali	*Bombay*
Sir Chintaman D. Deshmukh, KT., C.I.E., I.C.S. ...	
Mr. M. J. Dickins	
Mr. R. E. Hawkins	
Mr. H. B. Hayes	
Rev. Fr. H. Santapau, S.J.	
Dr. S. B. Setna, Ph.D.	
Dr. M. Sharif, D.Sc., Ph.D., F.N.I.	
Lt.-Col. Sir Sahib Singh Sokhey, I.M.S. ...	
Mr. Sálim Ali (Hon. Secretary)	
Mr. J. I. Alfrey (Hon. Treasurer)	

Advisory Committee

Lt.-Col. R. W. Burton, I.A. (Retd.)	*Bangalore*
Dr. B. N. Chopra, D.Sc.	*Benares*
Mr. C. H. Donald, F.Z.S.	*Dharmsala*
Rev. Fr. Dr. J. B. Freeman, M.A., L.T., Ph.D., D.D.	*Mysore*
Dr. S. L. Hora, D.Sc.	*Calcutta*
Mr. C. M. Inglis, B.E.M.B.O.U., F.Z.S.	*Darjeeling*
Mr. R. C. Morris, F.R.G.S., F.Z.S.	*Coimbatore*
Dr. S. K. Mukerjee, D.Sc.	*Calcutta*
Lt.-Col. E. G. Phythian-Adams, O.B.E., F.Z.S., I.A. (Retd.)	*Nilgiris*
Dr. Baini Prashad, D.Sc.	*New Delhi*

Staff

Sálim Ali	...*Curator*
V. K. Chari, B.A., L.T.	...*Asst. Curator*

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

List of members of the Executive and Advisory Committees elected for the year 1949.

Vice-Presidents

Maj.-Gen. Sir Sahib Singh Sokhey, I.M.S.
Mr. W. S. Millard, F.Z.S.

Executive Committee

Mr. R. E. Hawkins ... ...
Mr. M. J. Dickins ... ...
Sir Chintaman D. Deshmukh, KT., C.I.E., I.C.S. ...
Mr. H. B. Hayes ... ...
Rev. Fr. H. Santapau, S.J. ... ...
Dr. S. B. Setna, Ph.D. ... ...
Mr. P. M. Lad, I.C.S. ... ...
Mr. M. J. Hackney ... ...
Maj.-Gen. Sir Sahib Singh Sokhey, I.M.S. ...
Mr. Sálim Ali } (Hon. Secretaries) ...
Mr. Humayun Abdulali }
Mr. J. I. Alfrey (Hon. Treasurer) ... ...

} *Bombay*

Advisory Committee

Lt.-Col. R. W. Burton, I.A. (Retd.) ... ... *Bangalore*
Dr. B. N. Chopra, D.SC. ... ... *New Delhi*
Mr. C. H. Donald, F.Z.S. ... ... *London*
Rev. Fr. Dr. J. B. Freeman, M.A., L.T., Ph.D., D.D. *Mysore*
Dr. S. L. Hora, D.SC. ... ... *Calcutta*
Mr. C. M. Inglis, B.E.M.B.O.U., F.Z.S. ... ... *Darjeeling*
Col. R. C. Morris, F.R.G.S., F.Z.S. ... ... *Attikan*
Dr. S. K. Mukerjee, D.SC. ... ... *Calcutta*
Lt.-Col. E. G. Phythian-Adams, O.B.E., F.Z.S., I.A. (Retd.) ... ... *Nilgiris*
Dr. Baini Prashad., D.SC. ... ... *New Delhi*

THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1948

The Society's Journal

Volume 47, Nos. 3 and 4 and Volume 48, No. 1 were published during the year. The last number was again considerably delayed in reaching members. Every effort is being made to make up time so that future issues may be more punctual, but our press unfortunately seems helpless in the matter.

Mammals

In 'Bat Migration in India and other Notes on Bats' (Vol. 47, No. 3, p. 522), Humayun Abdulali gives some particulars of an experiment on bats undertaken by him in 1942-43 of ringing several species of bats in the various caves on Elephanta Island in Bombay

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Harbour, with a view to studying their local and migratory movements. The experiment was made on a modest scale and could not be persisted in for a long enough period, but it suggested the great possibilities inherent in this method for obtaining data on this much neglected branch of mammalogy. The article closes with a reference to various recent researches in the U.S. and elsewhere particularly on the senses in bats and their ability to avoid collision with obstacles in their flight even when blinded which suggest that this is done by 'echo location'. Bats produce supersonic cries as they fly which though inaudible to the human ear serve by their echoes to guide them clear of intervening obstacles.

An impassioned plea for the protection of wild life is contained in Lt.-Col. R. W. Burton's 'Wild Life Preservation: India's Vanishing Asset' (Vol. 47, No. 4, p. 662). The author after pointing out the various Indian animals threatened with extinction states that forgetfulness, indifference, ignorance and greed for gain on the part of Man are responsible for the present depletion and unless prompt steps are taken by Government to protect our wild life through the enactment of adequate laws and their efficient enforcement, control of firearms and finally an enlightened public opinion, many of our animals would vanish before our eyes. Col. Burton recommends the establishment of a Wild Life Department separate from the Forest Department, whose officials already overburdened with their own considerable work will not be in a position to devote their full attention to a subject such as this which requires constant observation and study. He would have it linked instead through the Ministry of Agriculture with the Provincial Agricultural and Forest Departments while a Central Game Fund is maintained in the Office of the Ministry of Agriculture. The article is followed by an extensive and useful bibliography on wild life protection in India.

Among the popular papers one that will appeal particularly to sportsmen is 'Jungle Memories' Part I—Tiger—by Lt.-Col. E. G. Phythian-Adams (Vol. 48, No. 1, p. 125). As the title indicates this article contains many interesting anecdotes of tigers and several valuable wrinkles for the young shikari in India. Col. Phythian-Adams has drawn freely from his shikar diary kept over a period of nearly 40 years in various parts of India but mostly in the Nilgiris. Further parts of the serial are to be published in the subsequent issues of the *Journal*.

In 'A Further Note on the Bearded Pig in Malaya' (Vol. 47, No. 4, p. 632) following an article entitled 'The Riddle of the Bearded Pig' by J. E. Kempe in a previous number of the *Journal*, C. A. Gibson-Hill of the Raffles Museum has made a valuable study of the distribution of this rare animal in Malaya. *Sus cristatus* was believed to be the only wild pig occurring in Malaya until 1918, when the first specimen of the Bearded Pig, *Sus barbatus* was obtained from Pekan. Since then several other records had turned up, but though plentiful in the adjacent islands of Sumatra and Riau Archipelago, its existence in Malaya side by side with *cristatus* remained a riddle and it was believed to be only an accidental straggler from the neighbouring islands. The subsequent

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

discovery among the deposits excavated from certain lime-stone caves in the peninsula, of tushes of *barbatus* has now established the animal to be indigenous to the mainland. Gibson-Hill after examining all the available records of its occurrence both prehistoric and contemporary, takes the view that the Bearded Pig has survived in Malaya from Neolithic times in isolated pockets in small numbers, 'erupting' at intervals into more densely inhabited areas.

Birds

'The Birds of the Mishmi Hills' by Sálim Ali and S. Dillon Ripley is among the important regional papers published during the year (Vol. 48, No. 1, p. 1). This area was relatively unknown ornithologically until the present survey was undertaken which accounts for the 14 new forms reported in this paper. A discussion of the geology of the Mishmi Hills, its altitudinal and life zones and the affinities of its avifauna contribute to the importance of the study.

'Some Birds of the Gandak-Kosi watershed, including the pilgrim trail to the sacred lake of Gosainkund' (Vol. 47, No. 3, p. 432) is the ornithological diary of Mr. B. E. Smythies of the Burma Forest Service during his trip to Nepal. A list of 45 birds seen during this trip and useful notes on many of them make it a valuable contribution to the little known ornithology of Nepal.

'The Storm Petrels occurring in the Northern Indian Ocean and Adjacent Seas' by C. A. Gibson-Hill (Vol. 47, No. 3, p. 443) is again a study in distribution of the 4 species of storm petrels recorded from the Indian Ocean—Wilson's, the Black-bellied, the British and Swinhoe's.

The first of a serial on the taxonomy of Indian birds is Dr. S. Dillon Ripley's 'Notes on Indian Birds' (Vol. 47, No. 4, p. 622) which deals with the races of the Pipit *Anthus hodgsoni*. The author, basing his work on the collections in the U.S. National Museum, the American Museum of Natural History, the Academy of Natural Sciences and the Museum of Comparative Zoology and Peabody Museum and his own collections from the Mishmi Hills recognizes 4 races and provides a workable key for their identification. With this paper Dr. Ripley makes his debut in the *Journal*. We shall hope to see more and more of his contributions in our pages since he has now undertaken the gigantic task of preparing an up-to-date checklist of Indian Birds.

'A Census of Nests in a Private Bird Sanctuary' (Vol. 47, No. 4, p. 676) is the account of an ecological study of Indian birds made in the school compound at Dohnavur at the southern corner of the Madras Presidency. Mr. Webb-Peploe who contributed this article has since died, but it is hoped that at least a few of his colleagues and pupils with whose co-operation he has recorded these and other field observations on the animals of his area in the past, would keep up the interest he has infused into them.

'The Food Habits of 3 Kingfishers occurring on Singapore Island' were studied by Gibson-Hill (Vol. 48, No. 1, p. 146) with a view to testing the hypothesis that two species with similar ecology cannot live in the same area. The Indian Common Kingfisher

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

(*Alcedo atthis benghalensis*), the White-breasted Kingfisher (*Halcyon smyrnensis fusca*) and the White-collared Kingfisher (*Halcyon chloris humii*) were studied in this context and records within their whole breeding range were examined. A comparison of the structure of the bills of the three species was also made. As a result, he comes to the conclusion that though the same feeding methods are adopted by all the three, each seems to show a definite preference for three different fields, *Alcedo atthis* 'feeding typically and largely from and over water', *H. chloris* from 'mangrove mud-banks and muddy beaches' and *H. smyrnensis* from 'dry ground and open country away from water'.

Particulars of 72 rings recovered from marked birds shot or found dead within Indian limits, compiled from various sources and brought together in one place will prove of great use to students of bird migration (Vol. 47, No. 4, p. 690).

'Astanmarg' (Vol. 48, No. 1, p. 38) is a delightful account from the pen of Col. R. S. P. Bates of a holiday in this Himalayan valley and his encounters with its birds and flowers. The article is illustrated with some of Col. Bates's superb photographs.

Reptiles and Fishes

In his 'Notes on a few Reptiles from the Nilgiri Hills' (Vol. 47, No. 3, p. 552) Garth Underwood furnishes a list of 5 lizards and 2 snakes he collected in that area. The same author's 'Notes on Poona Reptiles' (Vol. 47, No. 4, p. 627) listing 1 tortoise, 13 lizards and 12 snakes include field notes on several forms.

That the King Cobra believed to be the fastest snake in India is no faster than the average good-sized rat snake, and that an average man running hard would have no difficulty in outdistancing either are the conclusions reached by S. K. Ghosh, of Calcutta, who narrates an exciting encounter with a King Cobra in the Sajek Valley in Assam (Vol. 47, No. 4, p. 760).

Among the more important papers on Fishes and Fisheries published during the year are the following:—

'Methods of collection and hatching of Carp ova in Chittagong with some suggestions for their improvement' by Nazir Ahmed (Vol. 47, No. 4, p. 593).

'Breeding and feeding habits of Mullets (*Mugil*) in Ennore Creek' by P. K. Jacob and B. Krishna Murti (Vol. 47, No. 4, p. 663).

'Some observations on the habits of *Hippocampus guttulatus*' by P. K. Jacob and A. D. Isaac Rajendran (Vol. 48, No. 1, p. 153).

Insects

Several regional papers on butterflies were published during the year of which the following are among the more important:—

'The Butterflies of the Andamans and Nicobars' by Lt.-Col. M. L. Ferrar (Vol. 47, No. 3, p. 470).

'The Butterflies of the Khasia and Jaintia Hills, Assam' by R. E. Parsons and Sir Keith Cantlie (Vol. 47, No. 3, p. 498).

'Local lists of Lepidoptera from the Punjab and U.P.' by D. G. Sevastopulo (Vol. 47, No. 4, p. 586).

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Part XX of 'The Early Stages of Indian Lepidoptera' and 'The Food-plants of Indian Geometridae and Pyralidae' by the same author were also published. His 'Some suggestions for entomological work in India' published in Vol. 48, No. 1, p. 75, deserves to be read by every serious student of entomology. It contains valuable hints on lines of future work especially with regard to lepidoptera such as distribution, seasonal forms, diapause, temperature experiments, use of the secondary sexual apparatus, scents, intersexes produced by shock, palatability, colour perception, parasites, relations with ants, genetics, larval and pupal dimorphism, and hybridisation.

'Descriptions of Plant Galls from Travancore' by Dr. K. K. Nayar published in Vol. 47, No. 4, p. 669 listing 39 species of plants affected by galls suggests the scope of this study in a tropical country such as India.

Botany

The last part of 'Some Beautiful Indian Climbers and Shrubs' Part XXVIII (Vol. 47, No. 3, p. 401) dealing with *Bougainvillea* (Nyctaginaceae) by N. L. Bor and M. B. Raizada appeared during the year. It is proposed soon to have this popular serial published in book form.

Of systematic interest is Fr. H. Santapau's 'Notes on the Solanaceae of Bombay' published in Vol. 47, No. 4, p. 652. Although the paper is intended primarily to acquaint Indian botanists with modern work done in Europe and America on this family, the layman has much to benefit from the helpful keys given in the course of the article for several genera such as *Solanum*, *Datura*, etc.

The *Journal* maintained its usual interesting and varied crop of miscellaneous notes which always form such a popular feature.

A grant of Rs. 500 was received during the year from the National Institute of Sciences of India towards the publication cost of the *Journal*. For this the Committee wish to express their thanks to the Council of the Institute.

Publications

1. 'The Book of Indian Animals' by S. H. Prater. This, the second volume of the Society's Indian Natural History Series, was published in April. An edition of 3,000 copies has been printed out of which 802 were sold up to the end of the year. It contains 73 plates in colour and numerous line and half-tone illustrations.

2. 'Circumventing the Mahseer and other Sporting Fish in India and Burma' by Major A. St. J. Macdonald was published during the year. 1,000 copies have been printed out of which 169 copies were sold till 31st December. Slightly different in format from 'The Book of Indian Animals', it is attractively got up and profusely illustrated with 4 coloured and 17 black and white plates and 64 text figures. Its wealth of practical information on the different aspects of angling, will make it the fisherman's vade-mecum for many years to come.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

3. 1,000 sets of coloured picture postcards of Indian birds specially painted for the 4th edition of 'The Book of Indian Birds' by D. V. Cowen were also published by the Society out of which 220 sets have been sold.

4. 'Some Beautiful Indian Trees' by Rev. E. Blatter and W. S. Millard. Although a print order for 2,500 copies was placed with Messrs. Oliver & Boyd, Edinburgh, Scotland, as early as 1947, the book could not be brought out yet. Mr. Millard is putting whatever pressure he can on the printers, and it is hoped that the book would be out soon.

The publication of the projected 'Book of Indian Butterflies' as Volume III of the Society's Indian Natural History Series is held up pending the decision of the Government of India regarding the publication grant applied for through the Council of the National Institute of Sciences of India. The letterpress and illustrations for it are completely ready. It will be recalled that this was one of the items on the list of our proposed publications for which a subsidy was asked from the Central Government.

Revenue Account

Actual receipts amounted to Rs. 37,796-7-7 as compared with Rs. 33,820-12-0 during the year 1947. This increase of Rs. 3,975-11-7 in the revenue is due to the income derived from the sale of the Society's new publications,—'The Book of Indian Animals', 'Circumventing the Mahseer and other Sporting Fish in India and Burma' and bird picture postcards. The total proceeds of the sale of publications in 1948 was Rs. 12,073 as compared with Rs. 6,322 in 1947.

Life Members. During the year 1948, 3 life members died but 6 joined increasing the total number from 210 to 213.

Ordinary Members. 141 new members (including one Honorary member) were enrolled in 1948. Against this 60 resigned and 12 died. The total membership on 31st December 1948 was 1,398 an increase of 69 over the previous year. It must be mentioned, however, that the actual number of active and paying members is far less—perhaps not more than about 800. Since the end of the war we have lost contact with many members who stand on our list. Some of these may have died and others may not wish to keep up their connection with the Society.

Educational Activities

With the appointment of the new Nature Education Organiser in February 1948, our educational activities which proved so successful during the period between 1926 and 1928 have revived. It is gratifying that the Government of Bombay have been convinced of the usefulness and desirability of the scheme and have since sanctioned the finance needed for carrying it out. The work of this section has been as under:—

1. Nine lectures in English in three courses were given by the Nature Education Organiser at the Museum to Nature Study teachers from local secondary schools on Birds, Mammals, and

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Reptiles and Fishes followed by guided tours through the galleries. 247 teachers from 85 schools attended the courses.

2. A similar talk was given, but in Marathi and Gujarati to Nature Study teachers from primary schools followed by guided tours as before. 27 teachers from 14 schools took advantage of this opportunity.

3. As a result of these efforts, children from 50 schools visited the Museum accompanied by their teachers and the Nature Education Organiser took them round the galleries.

4. A leaflet was prepared in English setting forth the points to look for when inspecting the animals exhibited in the Museum and distributed to the schools for the use of the children.

5. Extramural lectures on animal life were given by the Nature Education Organiser at 5 schools.

ACKNOWLEDGMENTS

The thanks of the Committee are due to Mr. W. S. Millard for his continued help in looking after the Society's interests in London.

STAFF

Pending the appointment of a permanent Curator, Mr. Sálim Ali continued to look after the Museum in addition to acting as Honorary Secretary of the Society.

The Assistant Curator, Mr. V. K. Chari and office staff deserve a word of praise for the interest and co-operation they have shown in the satisfactory management of the Society's affairs.

APPENDIX TO THE HONORARY SECRETARY'S REPORT COVERING THE PERIOD JANUARY TO JULY 1949

MEMBERSHIP

It will be recalled that the Committee's resolution to increase membership fees was ratified at the Annual General Meeting held on 11th August last year. Members and the Executive Committee were naturally apprehensive of the effect this step might have on our membership strength. The enhanced fees came into force on 1st January and members will no doubt be interested to hear how they have been received. It is gratifying that the resignations due directly to the increased subscriptions have been far fewer than was feared. The number of new members joining since the commencement of the year has been less than during the same period of 1948 but this cannot be ascribed solely to this cause. It is just possible that a slowing down of effort on the part of existing members to enlist new ones may be partly responsible. The question of keeping up membership strength is vital to the Society, and the Committee looks to every individual member to do his utmost in obtaining at least one new member in the course of a year. This should not be beyond the power of anyone to do, and every member should treat it as his duty to the Society, if he wishes that the Society should continue to prosper. During the 7 months under review 47

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

new members joined including 5 life members (one new and 4 by compounding) and 36 resigned or died leaving us 7 to the good.

Government Grants-in-aid for Publication of the Journal

It is gratifying to report that our efforts, initiated through the personal interest of Sir Chintaman Deshmukh, to obtain financial assistance from Government to maintain unbroken publication of the Society's journal, during the period of its financial uncertainty following 15th August 1947, have borne fruit. A grant-in-aid of Rs. 4,000 per annum for 3 years has been received from the Government of Bombay, and another of Rs. 8,000 per annum for a like period from the Central Government. The Society's membership position will be reviewed by Government after 3 years and if inspite of all our efforts it continues to remain unsatisfactory they will decide whether to continue the subsidy or not. In the meantime it is comforting to feel that for the next 3 years at any rate the regular publication of the *Journal* is assured, and it is hoped that our membership position at the end of that period will show a substantial improvement.

Nature Education

Our thanks are due to the Government of Bombay also for sympathetic consideration of representations made to them in regard to the desirability of a nature education scheme in connection with the Natural History Section of the Prince of Wales Museum. Government have been pleased to sanction a sum of about Rs. 4,600 annually for 3 years in the first instance, towards the salary and expenses of the Nature Study Organiser appointed by the Society in February 1948 in anticipation of sanction. The account of the work done in this department during 1948 is given in the Annual Report.

During the period from January to July the museum nature education programme has been further expanded both in regard to activity with schools and with the general public. The Nature Education Organiser has for the last several months been giving popular talks on various natural history subjects every Sunday morning in English, followed in some cases with a repeat of the same in Gujarati and Marathi. Unfortunately the response from the public has so far been disappointing, but a progressive though slow increase of interest is becoming noticeable, and with persistence it is hoped to make these gallery talks a popular Sunday feature of the Natural History Section.

Conservation of Wild Life

The establishment of the so-called Kanheri National Park and of the Wild Life Sanctuary at Dandeli in Kanara District is a wise and farsighted step on the part of the Bombay Government, and is an earnest of the keen interest taken by our Premier in the matter of educational and recreational amenities for the ordinary citizen. The Society were invited to nominate a representative on the Directorate of Parks and Gardens. Mr. Humayun Abdulali,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

the Society's nominee, has been particularly active in pleading the cause of wild life and in trying to bring about a total closure of shooting on the island of Salsette. He is also experimenting with the introduction of partridges, junglefowl, spurfowl, hares and the smaller deer into the park area so as to add to its natural attractions for visitors. If these animals are to thrive and increase, it is essential that all shooting and netting should be prohibited in the environs of the area, and adequate measures adopted to ensure that the restrictions are enforced and offenders strictly dealt with. The Society have recently attempted to move the police to prosecute several hotels and restaurants in the city which are brazenly advertising and selling partridge and other game birds during the close season. The police report that under the existing laws it is impossible to prosecute with any hope of conviction and it is apparent that the laws will have to be revised and brought into line with existing conditions.

The Government of Bombay have entrusted all matters in connection with wild life in the Province to the Director of Parks and Gardens jointly with the Chief Conservator of Forests, and our representative is busy revising the game laws so as to bring them in line with more progressive ones existing in other provinces, and in keeping with present day conditions, to ensure the preservation of our fast disappearing wild life.

At the invitation of the Government of Assam the Society deputed two of its members, Dr. Dillon Ripley and Mr. Sálim Ali to visit some of the rhinoceros and other wild life sanctuaries in that province and submit proposals for improving them and for making them more accessible and educative for local visitors, and an attraction for foreign tourists. The memorandum and suggestions of this commission, as amended and approved by our wild life experts, Mr. R. C. Morris and Lt.-Col. R. W. Burton, as well as by other competent sportsman and naturalist members resident in Assam has been submitted to the Assam Government with a request that they take early practical measures on the lines recommended in order to avert the fate towards which wild life is rapidly drifting.

In response to an invitation issued to the Society by the UNESCO to send a representative to the Technical Conference for the Protection of Nature to be held at Lake Success (U.S.A.) in August this year, our member Dr. Dillon Ripley has been requested to attend on behalf of the Society and move a resolution, if a suitable opportunity offers, enjoining on the Government of Assam to give effect to the Society's recommendations particularly in regard to the protection and preservation of the Great One-horned Rhinôceros.

The Honorary Secretary, Mr. Humayun Abdulali, announced the election of the following 103 members since the last meeting.

From 11th August 1948 to 31st December 1948

Mr. F. R. Danter, T.D.L. Association, Nasik; Dr. M. Sageer, Bombay; Mr. Nazar Futehally, Bombay; Shri B. K. Ghoshal, Director of Industries, Kanpur, U.P.; Shri Rameshwar Dayal,

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Deputy Commissioner, Delhi; Shri A. Gupta, I.P., Saharanpur, U.P.; His Excellency Lt. General Sir Archibald Nye, G.C.S.I., G.C.I.E., K.C.B., K.B.E., M.C., New Delhi; Shri G. K. Handoo, I.P., New Delhi; Raja Shanker P. S. Deo, P.O. Chichli, via Godarwara; The Hon'ble Mr. Justice G. S. Rajadhyaksha, I.C.S., Bombay; Major C. R. Dotiwalla, I.A., Mhow Cantt., Madhya Bharat; The Bursar, Andhra Christian College, Guntur; Mr. K. Karunakaran Nair, M.SC., Bombay; Mr. R. S. Vatcha, Bombay; Lt.-Col. W. P. Horsburgh, c/o. Grindlays Bank Ltd., Bombay; Mr. K. P. Mathrani, I.C.S., Rajkot; Mr. D. R. Gadgil, Yerandawana, Poona; Mr. K. M. Kingaby, Bombay; Mr. A. S. Hinton, Milikajan P.O., & T.O., Assam; The Librarian, I.E.M.E.L. 32, Infantry Workshops, Amritsar; Mr. M. V. Pai, B.SC. (Econ.), Bhavnagar; Dr. M. G. Pradhan, Bombay; Dr. H. P. Moelgavkar, Bombay; Mr. S. Moolgavkar, Bombay; Mr. J. F. Dastur, M.SC., F.N.I., I.A.S. (Retd.), Bombay; Miss Nina Premchand, Bombay; Mr. L. G. O. Woodhouse, Ceylon; Mr. G. I. Lightle, Bombay; Sardar Gian Singh Rarevalla, B.A., Prime Minister of Patiala, Patiala; Mr. R. B. Das, Bombay; Mr. Sodhi Kartar Singh, P.O. Anandpur, District Hoshiarpur (E. Punjab); Prof. S. P. Agharkar, M.A., Ph.D., F.L.S., F.N.I., Poona; The Secretary, Board of Agriculture, Katmandu, Nepal; Mrs. Pott, Ootacamund, Nilgiris; Mr. W. W. Mayne, B.SC., Munnar P.O., Travancore; The Secretary, Kasturba Mahila Mandal, P.O. Kausani, District Almora; The Principal, Queen Mary's College, Madras; Mr. D. D. Watters, Bombay; Mr. S. H. Prater, O.B.E., C.M.Z.S., London; The Principal, St. Augustine's English School, Kalimpong, West Bengal; Mr. Behran Vicaji, Bandra, Bombay; Mr. S. P. Shahi, M.SC., A.I.F.C., Divisional Forest Officer, Ranchi; Dr. S. R. Captain, M.R.C.V.S., R.W.I.T.C., Bombay; The Director of Fisheries, Dundas Street, Karachi; The Mess President, Officers' Mess, Madras Regimental Centre, Nilgiris, S.I.; Kanwar Balram Singh, c/o Messrs. Balmer Lawrie & Co. Ltd., Calcutta; Mr. D. C. Matthai, c/o Messrs. McLeod & Co. Ltd., Calcutta; Mrs. John D. Fosque, c/o Caltex (India) Ltd., Bombay; The Principal, Agricultural College & Director, Agricultural Research Institute, Hebbal, Bangalore; Mr. A. Middleton, Aldur P.O., Mysore State; Mr. Geoffrey J. E. Percival, Norwood, Ceylon; Mr. F. E. G. Holton, Coimbatore, S.I.; Raja S. V. Jagannadha Rao, Raja Sahib of Jatprole, Kurnool District; Capt. M. J. Preston, Bangalore Cantonment; Mr. Elijah Nathan Elijah, Bombay; Mrs. Phiroza J. Taleyarkhan, Bombay; Dr. A. R. Ranjha, D.SC., c/o. The Zoological Survey and Marine Fisheries Department, Pakistan; The Officer-in-Charge, Zoological Survey and Marine Fisheries Department, Karachi; Mr. K. S. Lauly, B.SC. (Hons.), M.SC. (Tech.) Dandeli P.O., N. Kanara; Capt. W. S. Massey, North Wynaad, Malabar; Mr. L. F. P. Russell, Naharkatia P.O., Assam.

From 1st January to 4th August 1949

Mr. R. F. Elliott, Calcutta; Raja Bir Udit Pratap Sekhar Deo, Ruler, Gangpur, Jharsuguda; Dr. A. L. Furniss, Victoria Leprosy

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Hospital, Hyderabad (Deccan); Major W. L. Roseveare, I.S.E. (Retd.), c/o. Lloyds Bank Ltd., London; Capt. A. R. Chowdhury, c/o. Agent, Imperial Bank, Dacca; Mr. W. J. Carrot, Burma Civil Service, Rangoon; Mr. C. N. Subramanian, Kadamane Estate, Saklaspur, Mysore; Miss K. A. D. Naoroji, Bombay; Mr. Saros A. D. Naoroji, Bhuj, Kutch; Mr. John Edge, E. Dooars, West Bengal; Mrs. D. D. Saini, Bombay; Mr. Hasanali K. Merchant, Agent, Standard Vacuum Oil Co., Bhavnagar; Mr. A. F. W. Humphreys, New Delhi; H.H. The Maharaja of Dhrangadhra, Dhrangadhra; Mr. M. A. Islam, Divisional Forest Officer, Gauhati, Assam; Mr. M. C. Jacob, Junior Conservator of Forests, Shillong, Assam; The Principal, Cotton College, Gauhati; Mr. S. C. Roy, Calcutta; Dr. De. V. Renato, Greens Hotel, Bombay; Mr. S. S. Dhareshwar, B.SC., Chikodi, Belgaum; Mr. D. J. Wood, Cinnamara P.O., Assam; Mr. T. E. Sibbit, Rydak T. E., E. Dooars, Bengal; Mr. P. F. Cumberlege, c/o. Messrs. Burmah-Shell, Madras; Mr. Pratapsinh Karsondas Asâr, Bombay; The Director, Pakistan Forest College, West Punjab, Pakistan; The Divisional Forest Officer, Poona; The Chief Conservator of Forests, United States of Rajasthan, Rajasthan, Kotah; The Director of Parks & Gardens, Bombay Province, Bombay; The Divisional Forest Officer, Kanara Eastern, Dharwar; Mr. A. E. G. Best, c/o. The Grahams Trading Co. (India) Ltd., Bombay; The Divisional Forest Officer, Satara; The Divisional Forest Officer, Nasik W.; Rev. Ernest M. Shull, Thana District; The Divisional Forest Officer, W. D. Kanara Dn., Karwar; The Divisional Forest Officer, North Khandesh Dn., Dhulia; Mr. Thakur Bhawani Singh, Jodhpur; Rev. L. E. Pocklington, Saranga P.O., W. Bengal; Mr. C. A. Caldeira, Canal Street, Calcutta; Mr. A. S. Talati, Dist. Chhindwara; The Divisional Forest Officer, Kanara Northern, Dharwar; Mr. Camar S. C. Tyabjee, Gunfoundry Road, Hyderabad Deccan; Mrs. Doris Ferreira, Bandra, Bombay.

BOMBAY NATURAL HISTORY SOCIETY
BALANCE SHEET AS AT 31st DECEMBER, 1948

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

BOMBAY NATURAL HISTORY SOCIETY

BALANCE SHEET AS AT 31st DECEMBER, 1948

LIABILITIES	Rs A P	Rs A P
Life Membership Fees :		85,790 0 0
Donations for specific purposes :		
From States for Survey Expenses (as per last Balance Sheet)		13,900 0 0
Sundry Creditors :		
For Printing, etc., of Journals ...	7,974 7 6	
,, ,, ,, of Circumventing the Mahseer and other Sporting Fish in India	3,703 0 0	
,, ,, ,, of Calendars ...	4,917 8 0	
,, *Expenses :*		
Royalties to Authors of Books ...	2,227 1 0	
Outstanding Creditors for Expenses (Audit Fee, Printing, Stationery, Sales Tax, etc).	399 8	
,, *Others :*		
Amount received in advance for Beautiful Indian Climbers and Shrubs	21 12 0	
		19,273 5 0
Suspense Account :		79 3 0
Surplus Account :		
Balance as per last Balance Sheet ...	52,240 13 5	
Less—Excess of Expenditure over income...	18,350 7 6	
		33,890 5 11
Total ...		1,52,932 13 11

ASSETS	Rs A P	Rs A P
Investments—At Holding value or Market value, whichever is lower :—		
Rs. 14,000 4% Bombay Port Trust Bonds.	10,780 0 0	
,, 15,000 4% Bombay Improvement Bonds ...	11,400 0 0	
,, 35,000 3% Funding Loan 1966-68 ...	35,812 10 0	
,, 25,000 3% Conversion Loan 1946 ...	25,000 0 0	
,, 2,000 3% First Development Loan 1970-75 ...	1,948 12 0	
Rs. 92,000 (Market value at 31st Dec. 1948 was Rs. 94,653-12-0).		
£450 3% Defence Bonds	6,133 5 4	
		91,074 11 4
Furniture :		
As per last Balance Sheet	1,690 0 0	
Additions during the year	46 15 0	
	1,736 15 0	
Less—Depreciation...	25 0 0	
		1,711 15 0
Sundry Debtors		6,655 4 3
Advance to the Staff		100 0 0
Advances for Publications :		
Poisonous Terrestrial Snakes of India, Burma and Ceylon (as per last Balance Sheet)	75 0 0	
Some Beautiful Indian Climbers and Shrubs	4,556 4 4	
Book of Indian Butterflies (as per last Balance Sheet)	697 7 6	
		5,328 11 10
Stock of Books, Calendars, etc., on hand (at cost) (as certified by the Secretary) :-		
Book of Indian Birds—2,217 copies ...	12,748 0 0	
Book of Indian Animals—2,145 copies ...	12,602 0 0	
Circumventing the Mahseer and other Sporting Fish in India—814 copies ...	3,409 0 0	
Old Journals—12,300 copies	3,075 0 0	
Wild Life Calendars—115 Nos.... ...	158 0 0	
One full set of Journals series and one Jackal Mask	530 0 0	
Picture postcards—773 Sets	870 0 0	
Game Birds of India Vol. III Bound and unbound—480 Nos.	4,950 0 0	
		38,352 0 0
Cash—		
With National Bank of India, Ltd., Bombay	3,584 5 3	
With National Bank of India, Ltd., London, £433-3-10	5,775 14 3	
On hand	350 0 0	
		9,710 3 6
Total ...		1,52,932 13 11

Note.—A stock of valuable research collection and Library Volumes have not been taken into account on the Assets side of the Balance Sheet.

We have prepared the above Balance Sheet from the books of account maintained and from the information given to us, and have verified the Investments, and Bank Balances. In our opinion, such Balance Sheet represents a true and correct view of the state of the Society's affairs according to the best of our information and explanations given to us.

BOMBAY, *6th May, 1949*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants
Registered Accountants } AUDITORS.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

BOMBAY NATURAL HISTORY SOCIETY

Dr. *INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1948* *Cr.*

EXPENDITURE	Rs A P	Rs A
To Salaries (including Dearness Allowance)		36,045 1 0
,, Contribution to Staff Provident Fund ...		1,272 7 0
,, Cost of Printing, etc., of Journal ...		11,925 2 10
,, Rent		1,680 0 0
,, General Charges		1,179 4 3
,, Stationery and Printing (Rs. 135-14-0 on account of Wild Life Conservation Propaganda)		814 7 3
,, Postage		2,056 1 6
,, Library		686 12 3
,, Fire Insurance		170 0 0
,, Audit Fee		250 0 0
,, Bad Debts		42 11 0
,, Depreciation on Furniture		25 0 0
Total ...		56,146 15 1
Game Birds of India Vol. III		
To Stock on 1st January, 1948 Bound Copies	1,056 0 0	
,, Stock on 1st January, 1948 Unbound Copies	4,000 0 0	
,, Royalties to Author		5,056 0 0
,, Sundry Charges—Packing, etc.		78 9 0
,, Profit transferred to Income and Expenditure Account		17 7 0
		8 12 0
Total ...		5,160 12 0
Book of Indian Birds, 4th Edition		
To Stock on 1st January, 1948		15,876 0 0
,, Royalties to Author		1,253 0 0
,, Sundry Charges—Packing, etc.		188 8 3
,, Profits transferred to Income and Expenditure Account		1,907 11 2
Total ...		19,225 3 5

INCOME	Rs A P	Rs A P
By Subscriptions		19,602 3 7
,, Entrance Fees		1,340 5 4
,, Sales of:		
Journals	2,451 2 2	
Society's Publications	129 13 3	
		2,580 15 5
,, Profit on Sales of:		
Game Birds of India, Vol. III ...	8 12 0	
Book of Indian Birds	1,907 11 2	
,, ,, Animals	4,289 14 4	
Circumventing the Mahseer and other Sporting Fish in India	709 13 3	
Bird Picture Postcards	240 7 9	
Wild Life Calendars	2,335 6 3	
		9,492 0 9
,, Interest on Investments		3,733 7 0
,, Sundries :—		
Profit on outside work	124 5 6	
,, ,, sale of Securities ...	770 10 0	
Advertisements in Journals	152 8 0	
		1,047 7 6
,, Excess of Expenditure over Income Transferred to Balance Sheet		18,350 7 6
Total ...		56,146 15 1
By Sales during the year		200 12 0
,, Stock on 31st December, 1948 Bound Copies	960 0 0	
,, Stock on 31st December, 1948 Unbound Copies	4,000 0 0	
		4,960 0 0
Total ...		5,160 12 0
By Sales during the year		6,477 3 5
,, Stock on 31st December, 1948		12,748 0 0
Total ...		19,225 3 5

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Dr. *INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1948*—(continued.) *Cr.*

EXPENDITURE	Rs A P	Rs A P	INCOME	Rs A P	Rs A P
Book of Indian Animals					
To Cost of Printing and Publishing 3,000 Copies		17,682 12 9	By Sales during the year		10,691 8 4
,, Royalties to Author		642 0 0	,, Stock on 31 December, 1948		12,602 0 0
,, Sundry Charges—Packing, etc.		678 13 3			
,, Profit transferred to Income and Expenditure Account		4,289 14 4			
Total ...		23,293 8 4	Total ...		23,293 8 4
Circumventing the Mahseer and Other Sporting Fish in India					
To Cost of Printing and Publishing 1,000 Copies		4,245 13 6	By Sales during the year		2,138 1 6
,, Royalties to Author		253 8 0	,, Stock on 31st December, 1948		3,409 0 0
,, Sundry Charges—Packing etc.		337 14 9			
,, Profit transferred to Income and Expenditure Account		709 13 3			
Total ...		5,547 1 6	Total ...		5,547 1 6
Picture Post-Cards					
To Cost of Printing and Publishing 1,000 sets		1,122 6 0	By sales during the year		525 12 9
,, Sundry Charges—Packing, etc.		32 15 0	,, Stock an 31st December, 1948		870 0 0
Profit transferred to Income and Expenditure Account		240 7 9			
Total ...		1,395 12 9	Total ...		1,395 12 9
Calendars					
To Stock on 1st January, 1948		18 12 0	By Sales during the year		7,734 10 0
,, Cost of Printing, etc.		4,995 8 0	,, Stock on 31st December, 1948		158 0 0
,, Sundry Charges—Packing, etc.		542 15 9			
,, Profit transferred to Income and Expenditure Account		2,335 6 3			
Total ...		7,892 10 0	Total ...		7,892 10 0

BOMBAY, *6th June, 1949.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants,
Registered Accountants, } AUDITORS.

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

MINUTES OF THE ANNUAL GENERAL MEETING OF THE BOMBAY NATURAL HISTORY SOCIETY HELD IN THE LECTURE ROOMS OF THE B.E.S. & T. COMMITTEE, ELECTRIC HOUSE, ORMISTON ROAD, BOMBAY, ON THURSDAY THE 4th AUGUST 1949, AT 6 P.M.

1. The Managing Committee's Report for the year ended 31st December 1948 having been circulated among members was taken as read.

2. The Honorary Secretary read a supplementary report on the activities of the Society during the current year and again stressed the need for increased membership. (for details see p. 622)

3. When presenting the accounts the Honorary Treasurer explained that a saving of approximately Rs. 16,000 will be effected this year as the final instalment of gratuities had been paid off to members of the staff who had recently retired after long service.

4. The Executive and Advisory Committees for 1949 as previously proposed in the circular to members were duly elected, there being no fresh nominations received.

5. The Honorary Secretary asked for suggestions from the members present for popularising and adequately publicizing the activities of the Society. Several members expressed their views:

Fr. H. Santapau suggested that we should have monthly meetings where contributors of small papers to the *Journal*, for example the various miscellaneous notes, should present their observations in person as far as possible, initiating discussion and bringing about closer contact between members.

Dr. S. L. Hora expressed a similar opinion and the Honorary Secretary promised to try and arrange for such meetings in Bombay.

On the termination of the formal meeting, members and their friends attended an absorbing talk by Dr. S. L. Hora, the Director of the Zoological Survey of India on his Satpura Hypothesis of Indo-Malayan animal distribution (illustrated with lantern slides). This was followed by a film entitled 'Poultry: A Billion Dollar Industry' which was very kindly lent for the occasion by the United States Information Service.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CATALOGUE OF BOOKS IN THE BOMBAY NATURAL HISTORY SOCIETY'S LIBRARY

PART III—REPTILES, AMPHIBIANS & FISHES

R—Reptiles.

A—Amphibians.

P—Fish and Fisheries.

Ps = Fish—Sport and Angling.

RPr = Reptiles—Popular.

RFR = Fauna of British India Series (Reptiles & Amphibians).

PFR = do. do. (Fish). Reference volumes; not lent out.

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
					Adamson, Hans Christian	(*See* Carnochan, F. G. & Adamson, Hans Christian.)
1	R	51	5	F	Anderson, John	REPTILIA & BATRACHIA—ZOOLOGY OF EGYPT, Vol. I, 1898.
2	R	30	5	A	Anonymous	OPHIOLATREIA: An Account of the Rites & Mysteries connected with the Origin, Rise and Development of Serpent Worship, and a full description of the Celebrated Serpent Mounds & Temples—(Privately printed).
3	R	27	5	A	Berridge, W. S.	ALL ABOUT REPTILES & BATRACHIANS, 1935.
4	R	41	5	A	do.	MARVELS OF REPTILE LIFE, 1926.
5	R	1	5	A	Boulenger, George Albert	MONOGRAPH OF THE LACERTIDAE, Vol. I, 1920.
6	R	2	5	A	do.	MONOGRAPH OF THE LACERTIDAE, Vol. II, 1921.
7	R	3	5	A	do.	CATALOGUE OF THE LIZARDS IN THE BRITISH MUSEUM (Nat. History), Geckonidae, Eublepharidae, Uroplatidae, 2nd Edn., Vol. I, 1885.
8	R	4	5	A	do.	CATALOGUE OF THE LIZARDS IN THE BRITISH MUSEUM (Nat. History), Iguanidae, Xenosauridae, Zonuridae, Anguidae, Anniellidae, Helodermatidae Varanidae, Xantusiidae, Teiidae, Amphisbaenidae, Vol. II, 1885
9	R	5	5	A	do.	CATALOGUE OF THE LIZARDS IN THE BRITISH MUSEUM (Nat. History) Lacertidae, Gerrhosauridae, Scincidae, Anelytropidae, Dibamidae, Chamaeleonitidae, 2nd Edition, Vol. III, 1887.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
10	R	6	5	A	Boulenger, George Albert	CATALOGUE OF THE SNAKES IN THE BRITISH MUSEUM (Nat. History), Typhlopidae - Colubridae, Vol. I, 1893.
11	R	7	5	A	do.	CATALOGUE OF THE SNAKES IN THE BRITISH MUSEUM (Nat. History), Colubridae, Aglyphae, Vol. II, 1894.
12	R	8	5	A	do.	CATALOGUE OF THE SNAKES IN THE BRITISH MUSEUM (Nat. History), Colubridae (Opisthoglyphae & Proteroglyphae), Amblycephalidae & Viperidae, Vol. III, 1896.
13	R	9	5	A	do.	CATALOGUE OF THE CHELONIANS RHYNCOCEPHALIANS & CROCODILES IN THE BRITISH MUSEUM (Nat. History), New Edition, 1889.
14	RFR	45	5	A	do.	REPTILIA AND BATRACHIA—A VERTEBRATE FAUNA OF THE MALAY PENINSULA from the Isthmus of Kra to Singapore including the adjacent Islands, 1912.
15	RFR	52	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Lizards—Reptilia & Batrachia, 1890.
16	RFR	53	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Snnkes, 1890.
17	RFR	54	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Frogs, 1890.
18	RFR	55	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Crocodiles, Tortoises & Lizards, 1890.
19	RFR	56	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Snakes, 1890.
20	RFR	57	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Reptilia & Batrachia, 1890.
21	RFR	66	7	C	do.	THE FAUNA OF BRITISH INDIA INCLUDING BURMA & CEYLON, Crocodiles & Tortoises—Reptilia & Batrachia, 1890.
22	R	19	5	A	Bourret, Rene	LES SERPENTS DE L'INDOCHINE—Etudes sur la Faune—Tome I, 1936.
23	R	20	5	A	do.	LES SERPENTS DE L'INDOCHINE, Etudes sur la Faune—Tome II, 1936.
24	R	13	5	A	Broom, Robert	THE MAMMAL-LIKE REPTILES OF SOUTH AFRICA & THE ORIGIN OF MAMMALS, 1932.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
					Brunton, Sir Lauder	(*See* Fayrer, Sir Joseph, Brunton, Sir Lauder, & Rogers, Major Leonard.)
					Caius, R. P. F.	(*See* Phisalix, Marie & Caius, R.P.F.)
25	RPr	22	5	A	Carnochan, F. G. & Adamson, Hans Christian	THE EMPIRE OF THE SNAKES, 1935.
26	R	32	5	A	Cazalay, Major W. H.	THE COMMON SNAKES OF INDIA & BURMA & HOW TO RECOGNIZE THEM, 1914.
27	R	37	5	A	Corkill, Norman L.	SNAKES & SNAKE BITE IN IRAQ—A Handbook for Medical Officers. Royal College of Medicine of Iraq publication, 1932.
28	R	12	5	A	Derinayagala, P E P.	THE TETRAPOD REPTILES OF CEYLON—Testudinates & Crocodilians, *Ceylon Journal of Science*-(Colombo Museum Natural History Series), 1939.
29	R	11	5	A	Ditmars, Raymond L.	SNAKES OF THE WORLD, 1937.
30	R	29	5	A	Fayrer, Sir Joseph, Brunton, Sir Lauder, Rogers, Major LEONARD	ON THE POISON OF VENOMOUS SNAKES & THE METHOD OF PREVENTING DEATH FROM THEIR BITE, 1909.
31	R	46	5	F	Fayrer, J.	THE THANATOPHIDIA OF INDIA, being a description of the Venomous Snakes of the Indian Peninsula, with an account of the influence of their poison on Life; and a series of experiments, 1872.
32	R	64	5	F	do.	THE THANATOPHIDIA OF INDIA, being a description of the Venomous Snakes of the Indian Peninsula, with an account of the influence of their poison on Life; and a series of experiments, 1872.
33	R	28	5	A	Fitzsimons, F. W.	PYTHONS & THEIR WAYS, 1930.
34	R	18	5	A	Fitzsimons, Vivian F.	THE LIZARDS OF SOUTH AFRICA—Transvaal Museum Memoir No. 1, 1943.
35	R	36	5	A	Garcia, Evaristo	Los Ofidios Venenosos del Cauca Metodos Empiricos y Racionales Empleados Contra los Accidentes producidos por la Mordedura de Esos Reptiles, 1896.
36	R	31	5	A	Gharpurey, Lt.-Col. K. G.	THE SNAKES OF INDIA, 1935.
37	R	65	5	A	Giboin, Le Pharmacien Commandant Lucien.	L PRINCIPAUX SERPENTS DE L'INDE, Premiere Edition, 1948.
38	R	50	5	F	Gunther, Albert C. L. G.	THE REPTILES OF BRITISH INDIA—The Ray Society—1864.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
39	R	42	5	A	Kinghorn, J. R.	SNAKES OF AUSTRALIA, 1929.
40	R	43	5	A	do.	do.
41	R	44	5	A	do.	do.
42	R	48	5	F	Lamb, Capt. George	THE SPECIFICITY OF ANTIVENOMOUS SERA, WITH SPECIAL REFERENCE TO A SERUM PREPARED WITH THE VENOM OF *Daboia russellii* (*Vipera russellii*)—Scientific Memoirs by the Officers of the Medical & Sanitary Department of the Government of India. New Series—No. 16, 1905.
43	R	49	5	F	do.	SNAKE-VENOMS IN RELATION TO HAEMOLYSIS. Scientific Memoirs by Officers of the Medical & Sanitary Departments of the Government of India. New Series—Nov. 17, 1905.
					Leonard, Major Rogers	(*See* Joseph, Sir, Fayrer, Lauder, Sir, Brunton, Leonard, Major, Rogers.
44	R	39	5	A	Mathew, W. D.	DINOSAURS, with special reference to the American Museum collections—American Museum of Natural History, 1915.
45	R	24	5	A	Nicholson, Edward	INDIAN SNAKES, An Elementary Treatise on Ophiology, with a Descriptive Catalogue of the Snakes found in India & the adjoining countries, 2nd Edition, 1893.
46	R	25	5	A	do.	do.
47	R	15	5	A	Phisalix, Marie	ANIMAUX VENIMEUX ET VENINS, Tome i, 1922.
48	R	16	5	A	do.	ANIMAUX VENIMEUX ET VENINS, Tome ii, 1922.
49	R	21	5	A	Phisalix, Marie & Caius, R. P. F.	SNAKE VENOMS—Reprints from Journal et de Pathologie Generale Extrait du Tome xvii 1917-1918 and other Reprints on the subject from the Indian Journal of Medical Research, under the joint authorship of Caius, R.P.F., Anderson, Major, L.A.P., Iyyengar, Capt. K.R.K. & Steichen, Rev. Fr. A., 1923-1925.
50	R	14	5	A	Pitman, Capt. Charles R. S.	A GUIDE TO THE SNAKES OF UGANDA, 1938.
51	R	10	5	A	Pope, Clifford H.	THE REPTILES OF CHINA—Natural History of Central Asia, Vol. x (Central Asiatic Expedition), 1935.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
52	R	40	5	A	Prater, S. H.	THE SNAKES OF BOMBAY ISLAND & SALSETTE, illustrated by 6 plates & a text-figure—Prince of Wales Museum (Natural History Section)—Reprinted from the *J. B. N. H. S.* Vol. XXX, 1925. 2nd Edition, 1926.
53	R	66	6	A	Russell, Patrick	A CONTINUATION OF AN ACCOUNT OF INDIAN SERPENTS ; containing descriptions & figures, from specimens and drawings, transmitted from various parts of India, Vol. II, Part I, 1801.
54	R	67	6	A	do.	A CONTINUATION OF AN ACCOUNT OF INDIAN SERPENTS ; containing descriptions & figures, from specimens and drawings, transmitted from various parts of India, Vol. II, Part 2, 1801.
					Schlegel, H.	(*See* Siebold, PH. Fr. D. C., Temminck, C. J. & Schlegel, H.)
55	R	38	5	A	Sclater, W. L.	LIST OF SNAKES IN THE INDIAN MUSEUM, 1891.
56	R	68	6	A	Siebold, PH. Fr. D. C., Temminck, C. J. & Schlegel, H.	REPTILIA—Fauna Japonica, 1838.
57	R	26	5	A	Smith, Malcolm	MONOGRAPH OF THE SEA-SNAKES (*Hydrophiidae*)—The British Museum (Natural History), 1926.
58	RFR	58	7	A	Smith, Malcolm A.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Loricata, Testudines—Reptilia & Amphibia, Vol. I, 1931.
59	RFR	59	7	A	do.	THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON & BURMA, Sauria, Vol. II, 1935.
60	RFR	60	7	A	do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Serpentes, Vol. III, 1943.
61	RFR	61			do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Loricata, Testudines Reptilia & Amphibia, Vol. I, 1931.
62	RFR	62			do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Sauria, Vol. II, 1935.
63	RFR	63			do.	THE FAUNA OF BRITISH INDIA INCLUDING CEYLON & BURMA, Serpents, Vol. III, 1943.
					Temminck, C. J.	(*See* Siebold, Ph. Fr. D. C., Temminck, C. J. & Schlegel, H.)
64	R	17	5	A	Wall, Major F.	A POPULAR TREATISE ON THE COMMON INDIAN SNAKES, illustrated by coloured plates & diagrams (Reprinted from papers published in Vols. XVI—XXVI, 1905-1919.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
65	R	23	5	A	do.	OPHIDIA TAPROBANICA or The Snakes of Ceylon, 1921.
66	R	33	5	A	do.	THE POISONOUS TERRESTRIAL SNAKES OF OUR BRITISH INDIAN DOMINIONS & How to Recognize them (Reprinted with additions and corrections from papers which appeared in Vol. xvii of the *J.B.N.H.S.* 1907.
67	R	34	5	A	do.	do.
68	R	35	5	A	do.	A HANDLIST OF THE SNAKES OF THE INDIAN EMPIRE (Reprinted from papers published in Vols. xxix & xxx of the *J.B.N.H.S.*), 1923-1925.
					AMPHIBIANS	
1	A	3	5	A	Bourret, R.	LES BATRACIENS DE L' INDOCHINE 1941.
2	A	1	5	A	Parker, H. W.	A MONOGRAPH OF THE FROGS OF THE FAMILY MICROHYLIDAE, 1934.
3	A	2	5	A	Sclater, W. L.	LIST OF THE BATRACHIA IN THE INDIAN MUSEUM, 1892.
					FISHES	
1	P	53	5	C	Agricultural Marketing Adviser to the Government of India, The	PRELIMINARY GUIDE TO INDIAN FISH, FISHERIES, METHODS OF FISHING & CURING—Agricultural Marketing in India—Marketing Series No. 24, 1941.
					Bacon, Alban	(*See* Taverner, Eric, Nall, G. Herbert & Bacon, Alban.)
					Bean, Tarleton H.	(*See* Goode, George Brown & Bean, Tarleton H.)
2	P	22	5	B	Beavan, Capt. R.	HANDBOOK OF THE FRESHWATER FISHES OF INDIA, 1877.
3	P	83	5	C	do.	HANDBOOK OF THE FRESHWATE FISHES OF INDIA, giving the characteristic peculiarities of all the species at present known, & intended as a Guide to Students & District Officers, 1877.
4	P	59	5	C	Beebe, William	HALF MILE DOWN, 1935.
5	Ps	71	5	C	Bhattacharyya, P. N.	HINTS TO AMATEURS ON TANK ANGLING IN INDIA, 1915.
6	P	25	5	B	Boulenger, E. G.	THE AQUARIUM BOOK, 1925.
7	P	1	5	B	Boulenger, George Albert	CATALOGUE OF THE FRESHWATER FISHES OF AFRICA IN THE BRITISH MUSEUM (Natural History.), Vol. I, 1909.
8	P	2	5	B	do.	do. Vol. II, 1911.
9	P	3	5	B	do.	do. Vol. III, 1915.
10	P	4	5	B	do.	do. Vol. IV, 1916.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
11	P	31	5	B	Bowers, George M.	ARTIFICIAL PROPAGATION OF THE SALMONS OF THE PACIFIC COAST —extracted from the revised edition of the Fish Manual. pp. 1-15, plates 3-10. U.S. Commission of Fish & Fisheries, 1903.
12	P	34	5	B	do.	BULLETIN OF THE BUREAU OF FISHERIES—Department of Commerce & Labour—Vol. XXVIII, Part I, 1908, 1910.
13	P	35	5	B	do.	BULLETIN OF THE BUREAU OF FISHERIES—Department of Commerce & Labour—Vol. XXVIII, Part II, 1908, 1910.
14	P	74	5	F	Brough, James	THE TRIASSIC FISHES OF BESANO, LOMBARDY—British Museum (Nat. History), 1939.
15	P	90	5	C	Bruning, Christian	ICHTHYOLOGISCHER BILDERATLAS, 1929.
16	Ps	69	5	C	Buckland, Frank	LOG-BOOK OF A FISHERMAN & ZOOLOGIST, 1883.
					Bushman, J. S.	(*See* Jardine, Sir William & Bushman, J. S.)
17	P	44	5	C	Campbell, The Hon'ble, A. Y. G. & Nicholson, Sir F.A.	ADMINSTRATION REPORT, 1919-20 & Remarks on Canning & Manufacture of Fish Oil & Guano—Reports 1, 2 & 3 of 1921, Madras Fisheries Department Bulletin, No. 13, 1922.
					Chaudhuri, B. L.	(*See* Sewell, R. B. Seymour & Chaudhuri, B.L.)
					Chidambaram, K.	(*See* Devanesen, Rao Sahib, D. W. & Chidambaram, K.)
18	Ps	84	5	C	Clifford, George	FISHING—COMPASS BOOK No. 6, 1948.
					Cretin, E.	(*See* Lacy, G. H. & Cretin, E.)
19	P	24	5	B	Daniel, J. Frank	THE ELASMOBRANCH FISHES, 1922.
20	P	75	5	F	Day, Francis	THE FISHES OF INDIA being a Natural History of the Fishes known to inhabit the Seas & Freshwaters of India, Burma & Ceylon, Vol. I, Text, including Supplement, 1878-88.
21	P	76	5	F	do.	THE FISHES OF INDIA being a Natural History of the Fishes known to inhabit the Seas & Freshwaters of India, Burma & Ceylon, Vol. II, Atlas—containing 198 plates, 1878-1888.
22	P	79	5	F	do.	THE FISHES OF MALABAR, 1865.
23	PFR	88	7	A	do.	THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON & BURMA, Fishes, Vol. I, 1889.
24	PFR	89	7	A	do.	THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON & BURMA, Fishes, Vol. II, 1889.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
25	P	80	5	F	De, Kiran Chandra	REPORT ON THE FISHERIES OF EASTERN BENGAL & ASSAM, 1910.
26	P	92	5	C	Devanesen, Rao Sahib D. W. & Chidambaram, K.	THE COMMON FOOD-FISHES OF THE MADRAS PRESIDENCY—Dept. of Industries & Commerce, Madras, 1948.
27	P	77	5	F	Goode, George Brown & Bean, Tarleton H.	OCEANIC ICHTHYOLOGY, a treatise on the deep-sea & pelagic fish of the world based chiefly upon the collections made by the steamers Blake, Albatross & Fish Hawk in the Northern Atlantic, with an atlas containing 417 figures—Special Bulletin, Smithsonian Institution, U. S. National Museum, 1895.
28	P	40	5	C	Govindan, V.	FISHERY STATISTICS & INFORMATION, WEST & EAST COASTS, Madras Presidency—Madras Fisheries Bureau, Bulletin No. 9, 1916.
29	P	5	5	B	Gunther, Dr. Albert	CATALOGUE OF THE ACANTHOPTERYGIAN FISHES IN THE COLLECTION OF THE BRITISH MUSEUM—Gasterosteidae, Berycidae, Percidae, Aphredoderidae, Pristipomatidae, Mullidae, Spridae—Vol. I, 1859.
30	P	6	5	B	do.	CATALOGUE OF THE ACANTHOPTERYGIAN FISHES IN THE COLLECTION OF THE BRITISH MUSEUM—Squamipinnes, Cirrhitidae, Triglidae, Trachinidae, Sciaenidae, Polynemidae, Sphraenidae, Trichiuridae, Scombridae, Carangidae, Xiphiidae—Vol. II, 1860.
31	P	7	5	B	do.	CATALOGUE OF THE ACANTHOPTERYGIAN FISHES IN THE COLLECTION OF THE BRITISH MUSEUM–Gobiidae, Discoboli, Oxudercidae, Batrachidae, Pédiculati, Blenniidae, Acanthoclinidae, Comephoridae, Trachypteridae, Lophotidae, Tenthididae, Acronuridae, Hoplognathidae, Malacanthidae, Nandidae, Polycentridae, Labyrinthici, Luciocephalidae, Atherinidae, Mugilidae, Ophiocephalidae, Trichonotidae, Cepolidae, Gobiesocidae, Psychrolutidae, Centriscidae, Fistularidae, Mastacembelidae, Notacanthi—Vol. III, 1861.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
32	P	8	5	B	Gunther, Dr. Albert	CATALOGUE OF THE ACANTHOPTERYGII, PHARYNGOGNATHI AND ANACANTHINI IN THE COLLECTION OF THE BRITISH MUSEUM, Vol. IV, 1862.
33	P	9	5	B	do.	CATALOGUE OF THE PHYSOSTOMI, IN THE COLLECTION OF THE BRITISH MUSEUM containing the families Siluridae, Characinidae, Haplochitonidae, Sternoptychidae, Scopelidae, Vol. V, 1864.
34	P	10	5	B	do.	CATALOGUE OF THE PHYSOSTOMI, contd., containing the families Salmonidae, Percopsidae, Galaxidae, Mormyridae, Gymnarchidae, Esocidae, Umbridae, Scombresocidae, Cyprinodontidae, Vol. VI, 1866.
35	P	11	5	B	do.	CATALOGUE OF THE PHYSOSTOMI, contd., Heteropygii, Cyprinidae, Gonorhynchidae, Hyodontidae, Osteoglossidae, Clupeidae, Chirocentridae, Alepocephalidae, Notopteridae, Halosauridae, Vol. VII, 1868.
36	P	12	5	B	do.	CATALOGUE OF THE PHYSOSTOMI, contd., Gymnotidae, Symbranchidae, Muraenidae, Pegasidae and families of the Lophobranchii, Plectognathi, Dipnoi, Ganoidei, Chondropterygii, Cyclostomata, Leptocardii, Vol. VIII, 1870.
37	P	13	5	B	do.	CATALOGUE OF THE PERCIFORM FISHES IN THE BRITISH MUSEUM-Centrarchidae, Percidae and Serranidae (part), Vol. I, 2nd Edition, 1895.
38	P	21	5	B	Gunther, Albert C. L. G.	AN INTRODUCTION TO THE STUDY OF FISHES, 1880.
					do.	(*See* Playfair, Lt.-Col. R. Lambert & Gunther, Albert C. L. G.)
					Hamilton, R.	(*See* Jardine, Sir William & Hamilton, R.)
39	Ps	67	5	C	Hedges, F. A. Mitchell	BATTLES WITH GIANT FISH, 4th Edition, 1926.
40	P	52	5	C	Hefford, A. F.	REPORT ON THE WORK OF 'WILLIAM CARRICK', 1923.
41	P	37	5	B	Hornell, James	MADRAS FISHERY INVESTIGATIONS —Madras Fisheries Bureau, Bulletin No. 4, 1910.
42	P	38	5	B	do.	MARINE FISH-FARMING FOR INDIA —Madras Fisheries Bureau, Vol. II, Bulletin No. 6, 1911.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
43	P	39	5	C	Hornell James	MARINE FISHERY INVESTIGATIONS IN MADRAS 1914-15—Madras Fishery Department, Bulletin No. 8, 1916.
44	P	42	5	C	Hornell, James, Nicholson, Sir F. A. & Wilson, H.C.	THE EDIBLE MOLLUSCS OF THE MADRAS PRESIDENCY; A New Protozoan cause of mortality among Marine Fishes; The Fishing Industry of Tuticorin; The Indian Beche-de-mer Industry; Carp Growing in Germany; Treatment of Swamps and other Mosquito-infested Areas—Madras Fisheries Department, Builetin No. 11, 1918.
45	P	43	5	C	Hornell, James, Nayudu, M. Ramaswami, Wilson, H. C. & Panikkar, N. P.	ADMINISTRATION REPORT, 1918-1919, and The Outrigger Canoes of Indonesia—A Statistical Analysis of an Inshore Fishing Experiment at Madras, 1919; Reports of the Fisheries of the Nilgiris; Notes on the Cichlid Fishes of Malabar, Madras Fisheries Department, Bulletin No. 12, 1921.
46	P	45	5	C	Hornell, James	MADRAS FISHERY INVESTIGATIONS, 1921 (Second Series)—Madras Fisheries Department, Bulletin Vol. XIV, 1922.
47	P	46	5	C	do.	THE INDIAN PEARL FISHERIES OF THE GULF OF MANNAR & PALK BAY—Madras Fisheries Department, Bulletin, Vol. XVI, 1922.
48	P	48	5	C	do.	ADMINISTRATION REPORT, 1922-23 & The Fishing Methods of the Madras Presidency, Part I. Coromandel Coast, Reports Nos. 1 & 2 of 1924, Madras Fisheries Department, Bulletin No. 18, 1927.
49	P	55	5	C	do.	THE FISHING METHODS OF THE MADRAS PRESIDENCY, Madras Fisheries Department, Part II—The Malabar Coast; Report No. 1 of 1937, Madras Fisheries, Bulletin, Vol. XXVII, 1938.
50	P	57	5	C	Hornell, James, & Nayudu, M. Ramaswami	THE FLYING-FISH FISHERY OF COROMANDEL COAST & The Spawning Habits of Cypsilurus & a Note on the Eggs & the early embryonic development—Madras Fisheries Department, Report No. 4 of 1922, Madras Fisheries, Bulletin, Vol. XV, pp. 99-112, 1923.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

पुस्तकालय 48918 गुरुकुल कांगड़ी विश्वविद्यालय

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
51	P	26	5	B	Innes, William T.	EXOTIC AQUARIUM FISHES, A work of general reference, 2nd Edition, 1935.
52	P	14	5	B	Jardine, Sir William & Bushman, J. S.	ICHTHYOLOGY, Fishes particularly their structure & economic uses, The Naturalist's Library, Vol. XXXV, 1853.
53	P	15	5	B	Jardine, Sir William & Hamilton, R.	ICHTHYOLOGY: BRITISH FISHES, Part I, Vol. XXXVI, 1852.
54	P	16	5	B	do.	ICHTHYOLOGY: BRITISH FISHES, Part II, Vol. XXXVII, 1854.
55	P	17	5	B	Jardine, Sir William	ICHTHYOLOGY: FISHES OF THE PERCH FAMILY, Vol. XXXVIII, 1852.
56	P	18	5	B	Jardine, Sir William & Schomburgk, R. H.	ICHTHYOLOGY: FISHES OF BRITISH GUIANA, Part II, Vol. XL, 1852.
57	P	28	5	B	Jones, Thomas Rymer	THE AQUARIAN NATURALIST, A Manual for the Sea-side, 1858.
58	P	23	5	B	Jordon, David Starr	FISHES, 1925.
59	P	19	5	B	Kyle, Harry M.	THE BIOLOGY OF FISHES, 1926.
60	P	20	5	B	do.	do.
61	Ps	65	5	C	Lacy, G. H. & Cretin, Dr. E.	ANGLER'S HANDBOOK, North Punjab Fishing Club, 3rd Edition, 1895.
62	P	29	5	B	Lowe, Richard Thomas	A HISTORY OF THE FISHES OF MADEIRA, 1843-'60.
63	Ps	85	5	C	Macdonald, A. St. J.	CIRCUMVENTING THE MAHSEER & OTHER SPORTING FISH IN INDIA & BURMA, 1948.
64	Ps	70	5	C	Manley, J. J.	NOTES ON FISH & FISHING, 1877.
					Masterman, Arthur Thomas	(*See* McIntosh, William Carmichael & Masterman, Arthur Thomas.)
65	Ps	72	5	C	Masters, John	THE COMPLEAT INDIAN ANGLER, 1938.
66	P	25	5	B	McIntosh, William Carmichael & Masterman, Arthur Thomas	THE LIFE-HISTORIES OF THE BRITISH MARINE FOOD-FISHES, 1897.
					Nall, G. Herbert	(*See* Taverner, Eric, Nall, G. Herbert & Bacon, Alban.)
					Nayudu, N. Ramaswami	(*See* Hornell, James & Nayudu, M. Ramaswami, Wilson, H. C. & Panikkar, N. P.)
67	P	32	5	B	Nicholson, Sir F. A.	NOTES ON FISHERIES IN JAPAN, 1907.
68	P	36	5	B	do.	Papers from 1899 relating chiefly to the development of Madras Fisheries Bureau, Vol. I, Bulletin No. 1, 1915.
69	P	41	5	C	do.	ANNUAL REPORTS of the Madras Fisheries Bureau 1908-1917—Madras Fisheries Bureau Bulletin No. 10 (Part II of Bulletin No. 1), 1918.
					do.	(*See* Campbell, The Hon'ble, A. Y. G. & Nicholson, Sir F.A.)
					do.	(*See* Hornell, James, Nicholson, Sir F. A.& Wilson, H. C.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No	Cabinet	Shelf	Author	Title of Book
70	P	81	5	C	Norman, J. R.	A SYSTEMATIC MONOGRAPH OF THE FLAT FISHES (Heterosomata)—Psettodidae, Bothidae, Pleuronectidae—Vol. I, 1934.
71	P	82	5	C	do.	A HISTORY OF FISHES, 3rd Edition, 1947.
					PANIKKAR, N. P.	(*See* Hornell, James, Nayudu, Ramaswami M., Wilson, H. C. & Panikkar, N. P.)
72	P	78	5	F	Playfair, Lt. Col. R. Lambert, & Gunther, Albert C. L. G. Prater, S. H.	THE FISHES OF ZANZIBAR. Acanthopterygii & Pharyngognathi, etc., 1866.
						(*See* Spence, Sir Reginald & Prater, S. H.)
73	P	93	5	C	Rachow, A.	TROPICAL AQUARIA FISH CATALOGUE, 1927.
74	P	94	6	A	Russell, Patrick	DESCRIPTIONS AND FIGURES OF TWO HUNDRED FISHES COLLECTED AT VIZAGAPATAM ON THE COAST OF COROMANDEL, Vol. I, 1803.
75	P	95	6	A	do.	do. Vol. II, 1803.
76	P	91	5	C	Schmidt, Johs.	ON THE DISTRIBUTION OF FRESHWATER EELS (*Anguilla*) THROUGHOUT THE WORLD—Memoires de L'Academie Royale des Sciences et des Lettres de Danemark, Copenhague, ii Indo-Pacific region—a bio-geographical investigation, 1925.
					Schomburgk, R. H.	(*See* Jardine, Sir William & Schomburgk, R. H.)
					Service, Douglas	(*See* Taverner, Eric & Service, Douglas.)
77	P	58	5	C	Sewell, R. B. Seymour & Chaudhuri, B. L.	INDIAN FISH OF PROVED UTILITY AS MOSQUITO-DESTROYERS, 1912,
78	P	87	5	C	Siebold, Ph. Fr. de	FISHES OF JAPAN—Fauna Japonica, 1833.
79	Ps	68	5	C	Skene-Dhu	THE MIGHTY MAHSEER & OTHER FISH or Hints to Beginners on Indian Fishing, 1903.
80	Ps	64	5	C	do.	THE ANGLER IN INDIA OR THE MIGHTY MAHSEER, being the incorporated 3rd Edition of the Angler in Northern India & The Mighty Mahseer, 1923.
81	P	54	5	C	Sorley, H. T.	THE MARINE FISHERIES OF BOMBAY PRESIDENCY, 1933.
82	Ps	96	5	C	Spence, Sir, Reginald & Prater, S. H.	THE FISH SUPPLY OF THE WEST COAST OF INDIA; (Part I 3 Plates & Part II 5 Plates) GAME FISHES OF BOMBAY, THE DECCAN & THE NEIGHBOURING DISTRICTS OF THE BOMBAY PRESIDENCY (with 19 plates) (Bound reprints from the *J. B. N. H. S.*), Vol. XXXIV-XXXVI, 1931-1933.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Serial No.	Classification	Accession No.	Cabinet	Shelf	Author	Title of Book
83	P	47	5	C	Sundara Raj, B.	FISHERY REPORTS FOR 1923, Madras Fisheries Department, Bulletin No. 17, 1924.
84	P	49	5	C	do.	ADMINISTRATION REPORT FOR THE YEAR 1923-'24. Report No. 1 of 1923, Madras Fisheries Bulletin, Vol. XIX, pages 1-58. Madras Fisheries Department, 1925.
85	P	50	5	C	do.	ADMINISTRATION REPORT FOR THE YEAR 1924-'25, Report No. 1 of 1926, Madras Fisheries Bulletin, Vol. XX, pp. 1-78. Madras Fisheries Department, 1926.
86	P	51	5	C	do.	FISHERY REPORTS FOR 1928, Madras Fisheries Department, Bulletin No. 22, 1931.
87	P	56	5	C	do.	FISH STATISTICS FOR 1928-29, 1929-30 & 1930-31, Madras Fisheries Department, Reports Nos. 2, 3 & 4 of 1937—Madras Fisheries Bulletin, Vol. XXVII, 1939.
88	Ps	66	5	C	Taverner, Eric Nall, G. Herbert & Bacon, Alban	TROUT FISHING FROM ALL ANGLES. A complete guide to modern methods; Trout Scales; The legal aspect of fishing.—The Lonsdale Library, 1929.
89	P	73	5	C	Taverner, Eric & Service, Douglas	THE FLY-FISHER'S CLUB LIBRARY CATALOGUE, 1935.
90	Ps	60	5	C	Thomas, Henry Sullivan	THE ROD IN INDIA: being hints how to obtain sport, with remarks on the Natural History of fish, their culture & value, and illustrations of fish & tackle, 2nd Edition, 1881.
91	Ps	61	5	C	do.	do. do.
92	Ps	62	5	C	do.	do. 3rd Edition, 1897.
93	Ps	63	5	C	do.	do. do.
94	P	33	5	B	Unknown	JAPANESE FISHES (All paintings).
95	P	30	5	B	Wade, Rev. R. T.	THE TRIASSIC FISHES OF BROOKVALE, NEW SOUTH WALES, British Museum (Nat. Hist.), 1935.
96	Ps	86	5	C	Wilson, Lt.-Col. Alban Wilson, H. C.	TROUT FISHING IN KASHMIR, 1920. (*See* Hornell, James, Nayudu, M. Ramaswami, Wilson, H. C. & Panikkar, N. P.)
					do.	(*See* Hornell, James, Nicholson, Sir F. A. & Wilson, H. C.)

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

A few copies of **The Birds of Kutch** are available at the office of the Bombay Natural History Society, 114 Apollo Street, Fort, Bombay, at Rs. **20**/- each plus postage and packing. Members and others interested should apply immediately.

We have also for sale **Indian Hill Birds** by Sálim Ali with 64 beautifully coloured plates by the distinguished bird artist G. M. Henry. Price Rs. **20**/- per copy.

AND

Popular Handbook of Indian Birds by Hugh Whistler, 4th edition. Revised and enlarged by N. B. Kinnear. Price Rs. **19/12**.

Members will not be charged for postage and packing

WILD LIFE CALENDAR 1950

Illustrated with beautiful wild life photographs of Birds, Mammals, etc., by well-known Nature photographers.

Price Rs. **2-4-0** to Members. Rs. **3**/- to non-Members

Postage and Packing etc.

Published by

THE BOMBAY NATURAL HISTORY SOCIETY
114 APOLLO STREET, FORT
BOMBAY

PRINTED AND PUBLISHED BY V. M. PHILIP AT THE DIOCESAN PRESS,
18 CHURCH ROAD, VEPERY, MADRAS.—17-11-1949. C10464
EDITORS: SÁLIM ALI, S. B. SETNA AND H. SANTAPAU
114 APPOLLO STREET, FORT, BOMBAY

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

NOTICE TO CONTRIBUTORS

Contributors of scientific articles are requested to assist the editors by observing the following instructions:

1. Papers which have at the same time been offered for publication to other journals or periodicals, or have already been published elsewhere, should not be submitted.

2. The MS should preferably be typed (double spacing) on one side of a sheet only, and the sheets properly numbered.

3. All scientific names, to be printed in italics, should be underlined. Both in zoological and in botanical references only the initial letter of the genus is capitalized. The specific and sub-specific names always begin with a small letter even if they refer to a person or a place, e.g. *Anthus hodgsoni hodgsoni* or *Streptopelia chinensis suratensis* or *Dimeria blatteri*.

4. Trinomials referring to subspecies should only be used where identification has been authentically established by comparison of specimens actually collected. In all other cases, or where identification is based merely on sight, binomials should be used.

5. Photographs for reproduction must be clear and show good contrast. Prints must be of a size not smaller than $3\frac{1}{4} \times 2\frac{1}{4}$ inches (No. 2 Brownie) and on glossy glazed paper.

6. Text figures, line drawings and maps should be in Indian ink, preferably on Bristol board.

7. References to literature should be placed at the end of the paper, alphabetically arranged under author's name with the abridged titles of journals or periodicals underlined (italics), and titles of books *not* underlined (roman type), thus:

Roepke, W. (1949): The Genus Nyctemera Hübner. *Trans. ent. Soc. Lond.*, **100** (2): 47-70.

Prater, S. H. (1948): The Book of Indian Animals, Bombay.

Titles of papers should not be underlined.

8. Reference to literature in the text should be made by quoting the author's name and year of publication, thus: (Roepke, 1949).

9. *Synopsis*: As recommended by the Royal Society Scientific Information Conference (July 1948), the editors consider it desirable that each scientific paper be accompanied by a synopsis appearing at the beginning, immediately after the title. The synopsis should be factual. It should convey briefly the content of the paper; draw attention to all new information and to the author's main conclusions. It should also indicate newly observed facts, the method and conclusions of an experiment, and if possible the essential points of any new finding, theory or technique. It should be concise and normally not exceed 200 words.

When the synopsis is complete it should be carefully revised by the author to clarify obscurities, and further compressed wherever possible without detracting from its usefulness.

114 Apollo Street, Fort,
Bombay 1.

EDITORS,
Journal of the Bombay Natural History Society.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

THE SOCIETY'S PUBLICATIONS.

Mammals.

Book of Indian Animals, by S. H. Prater, with many coloured and black and white plates. Rs. 16.
(*Price to Members Rs.* 13).

Birds.

Game Birds of India, Vol. III. Pheasants, 1st Edition. Rs. 32.
(*Price to Members Rs.* 24).

Book of Indian Birds, by Sálim Ali, with many colour and black and white plates, 4th edition, revised and enlarged. Rs. 16.
(*Price to Members Rs.* 12-8).

Set of 12 Coloured Picture Postcards of Common Indian Birds. Rs. 2-4 net.

Fish.

Circumventing the Mahseer and Other Sporting Fish in India and Burma. Rs. 15.
(*Price to Members Rs.* 12).

Snakes.

Identification of Poisonous Snakes—
Folding Chart. Rs. 2-8.

Miscellaneous.

Wall Chart to distinguish a Wild Dog from a Domestic Dog or Jackal, etc. Rs. 2-8.

Back Numbers of the Journal.

Back numbers of the Society's Journal. Rates on application.

TERMS OF MEMBERSHIP.

Life Members pay an entrance fee of Rs. 25 and a Life Membership fee of Rs. 500.

Ordinary Members pay an entrance fee of Rs. 25 and an annual subscription of Rs. 30.

The subscription of members elected in October, November and December covers the period from the date of their election up till the end of the following year.

MEMBERS RESIDING OUTSIDE INDIA.

The terms are the same for members living outside India. Such members should pay their subscriptions by means of orders on their Bankers to pay the amount of the subscription, plus postage—in all Rs. 31-12-0—to the Society in Bombay on the 1st January in each year. If this cannot be done, then the sum of £2-8-0 should be paid annually to the Society's London Bankers—The National Bank of India, Bishopsgate Street, London, E.C.

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

Compiled
1999-2008

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

Digitized by Arya Samaj Foundation Chennai and eGangotri

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar